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Wildlife Specialist Report

Flagstaff Watershed Protection Project

Flagstaff Ranger District, Coconino National Forest
Coconino County, Arizona

Prepared by: /s/
Cary Thompson
Wildlife Biologist
Flagstaff Ranger District

Contents

Introduction

The following report summarizes existing conditions and effects from all alternatives to threatened, endangered, and Forest Service sensitive species (TES), management indicator species, migratory bird priority species that may occur or may have habitat within the Flagstaff Watershed Protection Project (FWPP), wildlife cover and key habitat components such as snags and downed logs. This specialist report was developed in consideration of the best available science.

Regulatory Framework

The Forest Service is legally required to comply with a number of federal regulatory requirements associated with various sections of the Endangered Species Act of 1973, as amended (ESA); the Bald and Golden Eagle Protection Act of 1940, as amended; Forest Service Manuals (FSM) 2620, 2630, 2670, and 2672; Migratory Bird Treaty Act of 1918 (as amended); Executive Order 13186 (migratory birds), National Environmental Policy Act, 1969; National Forest Management Act, 1976 (as amended); and the Coconino National Forest Land and Resource Management Plan (Forest Plan), 1987 (as amended).

The Endangered Species Act (ESA)

The Endangered Species Act (ESA) of 1973, as amended, provides that all Federal agencies utilize their authorities to carry out programs for the conservation of listed species. It prohibits any Federal agency from carrying out any action that is likely to jeopardize the continued existence of any listed species. It further requires federal agencies to consult with the Fish and Wildlife Service (FWS) on actions that are authorized, funded, or carried out by such agencies that may affect listed species and/or their designated critical habitat. The ESA mandates conference with the Secretary of the Interior whenever an action is likely to jeopardize the continued existence of any species proposed for listing as threatened or endangered, or whenever an action might result in destruction or adverse modification of critical habitat proposed for listing.

Bald and Golden Eagle Protection Act (Eagle Act)

The Eagle Act, originally passed in 1940, prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export, or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16U.S.C 668(a);50CFR 22). “Take” is defined as to “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb” a bald or golden eagle. The term “disturb” under the Eagle Act was recently defined via a final rule published in the Federal Register on June 5, 2007 (72 Fed. Reg.31332). “Disturb” means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. The Fish and Wildlife Service recommends using the *Conservation Assessment and Strategy for Bald Eagles in Arizona* (Driscoll et al. 2006) in conjunction with the *Bald Eagle National Management Guidelines* (USFS 2007) to protect bald eagles in Arizona.

Forest Service (FS) Sensitive Species

Sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: 1) significant current or predicted downward trends in population numbers or density, or 2) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5(19)). It is the policy of the Forest Service regarding sensitive species to 1) assist states in achieving their goals for conservation of endemic species, 2) as part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their

potential effect on sensitive species, 3) avoid or minimize impacts to species whose viability has been identified as a concern, 4) if impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (the Line Officer, with project approval authority, makes the decision to allow or disallow impacts, but the decision must not result in loss of species viability or create significant trends toward federal listing), and 5) establish management objectives in cooperation with the state when projects on National Forest system lands may have a significant effect on sensitive species population numbers or distributions. Establish objectives for federal candidate species, in cooperation with the U.S. Fish and Wildlife Service and Arizona State (FSM 2670.32).

Management Indicator Species (MIS)

A working draft forest-wide assessment entitled "Management Indicator Species Status Report for the Coconino National Forest" (USDA 2013) summarizes current knowledge of population and habitat trends for management indicator species on the Coconino National Forest. Additional site specific Game Management Unit (GMU) population information was provided by Arizona Game and Fish Department with their annual survey results.

Migratory Bird Treaty Act

Executive Order 13186 (January 10, 2001) requires federal agencies to consider management impacts to migratory birds. Birds considered for these analyses were selected from species of concern as listed by Partners in Flight (Latta, et al. 1999) and the USFWS Birds of Conservation Concern (USFWS 2009) and the determination of possible impacts that would occur if any one of the alternatives were implemented is disclosed.

Coconino National Forest Land Management Plan (COF LMP)

The Forest Plan determines standards and guidelines for snags and downed logs, wildlife cover, raptor nest buffers, old growth, turkey nesting and roosting habitat, and bear habitat. It also incorporates the 1996 Mexican Spotted Owl Recovery Plan and Northern Goshawk Management Recommendations. Two project-specific, non-significant amendments to the Coconino National Forest Land Management Plan are proposed for each action alternative. The first amendment would ensure the treatments proposed in MSO habitat align with the 2012 MSO Recovery Plan and would also remove timing restrictions within MSO PACs for the duration of the FWPP project. The second allows for mechanized harvest on slopes greater than 40 percent within the project area (see the Environmental Impact Statement for Forest Plan Amendment descriptions).

Overview of the Alternatives

Please see Appendix A for a full description of the alternatives and project design features. The following components were analyzed for potential affects:

Table 1: Actions by Alternative

Action	Alternative 2	Alternative 3	Alternative 4
Ponderosa Pine Fuels Reduction	DLH -1865 MM – 766	DLH -1865 MM – 766	DLH - 1400 MM- 766
Ponderosa Pine Fuels Reduction – Hand Thinning	DLH-150 MM - 0	DLH-150 MM - 0	DLH - 86 MM - 0
Mixed Conifer Fuels Reduction	DLH – 1140 MM - 0	DLH - 1158 MM - 0	DLH- 542 MM-0
Mixed Conifer Fuels Reduction - Hand Thin	DLH-132 MM-0	DLH-85 MM-0	DLH-0 MM-0
MSO PAC Fuels	DLH- 0	DLH- 0	DLH- 0

Action	Alternative 2	Alternative 3	Alternative 4
Reduction – Wet Mixed Conifer	MM – 180	MM – 180	MM- 0
MSO PAC Fuels Reduction	DLH-1167 MM- 1592	DLH-1195 MM- 1592	DLH - 568 MM- 1509
MSO PAC Fuels Reduction – Hand Thinning	DLH – 202 MM - 0	DLH – 202 MM - 0	DLH – 228 MM- 0
MSO PAC Fuels Reduction Burn Only	DLH-0 MM-0	DLH-0 MM-0	DLH-0 MM-33
MSO Nest/Roost Recovery – Burn Only	DLH – 37 MM - 0	DLH –37 MM - 0	DLH- 0 MM –0
MSO Nest Roost Recovery – Hand Thin	DLH-72 MM-22	DLH- 72 MM-22	DLH – 0 MM-22
MSO Nest Fuels Reduction- Burn Only	DLH - 261 MM – 402	DLH - 261 MM – 402	DLH – 0 MM – 0
MSO Nest Fuels Reduction Hand Thin	DLH -122 MM - 0	DLH – 122 MM – 0	DLH - 122 MM - 0
Northern Goshawk Post-fledgling Family Areas (PFA) Fuels Reduction	DLH -359 (181 overlaps MSO habitat) MM - 0	DLH – 359 (181 overlaps MSO habitat) MM - 0	DLH – 286 (181 overlaps MSO habitat) MM - 0
Northern Goshawk Nest Fuels Reduction	DLH – 100 (54 overlaps MSO habitat) MM - 0	DLH- 100 (54 overlaps MSO habitat) MM - 0	DLH – 100 (54 overlaps MSO habitat) MM - 0
Aspen Treatment	DLH -22 MM- 0	DLH - 22 MM- 0	DLH- 2 MM- 0
Grassland Restoration	DLH - 60 MM- 0	DLH-60 MM- 0	DLH - 53 MM - 0
Burn Only	DLH – 270 MM- 0	DLH -270 MM – 0	DLH – 67 MM – 0
Electronic Site – Structure Protection	DLH - 6 MM - 12	DLH - 6 MM -12	DLH - 6 MM – 12
Total Treatment Acres	DLH- 5963 MM- 2975	DLH- 5963 MM- 2975	DLH – 3459 MM - 2343
No Treatment (No New Analysis)	DLH - 836 MM-0	DLH - 836 MM - 0	DLH- 836 MM - 0
No Treatment	DLH – 769 MM-0	DLH – 769 MM- 0	DLH – 3274 MM- 631
Road Decommissioning and Closures	DLH - 3.7 MM – 0.12	DLH - 3.7 MM – 0.2	DLH - 3.7 MM – 0.2
Campfire Closure Order	Yes	Yes	Yes
Forest Plan Amendments	Amendments #2 and #3	Amendments #2 and #3	Amendment 2 and 3.
Temporary Roads	DLH – 17.4 MM - 3.6	DLH – 12.7 MM – 2.5	DLH- 10.2 MM – 2.5

Effects from Forest Plan Amendments

Amendment 1:. The effect of this Forest Plan amendment would be to facilitate more flexible management based on the updated 2012 MSO Recovery Plan rather than the 1987 Coconino National Forest Plan, which still depends on language from the original 1995 MSO Recovery Plan. Two primary reasons were cited for the original listing of the Mexican spotted owl in 1993: historical alteration of its habitat as the result of timber-management practices; and, the threat of these practices continuing as evidenced in existing national forest plans. The danger of stand-replacing wildland fire was also cited as a threat at that time. Since publication of the 1995 Recovery Plan, we have acquired

new information on the biology, threats, and habitat needs of the spotted owl. The primary threats to its population in the U.S. (but likely not in Mexico) have transitioned from timber harvest to an increased risk of stand-replacing wildland fire. Recent forest management now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which are more compatible with maintenance of spotted owl habitat conditions than the even-aged management regime practiced at the time of listing. Conversely, southwestern forests have experienced larger and more severe wildland fires from 1995 to the present than previous to 1995. Climate variability combined with current forest conditions may also synergistically result in increased loss of habitat from fire. The intensification of natural drought cycles and the ensuing stress placed upon forested habitats could result in even larger and more severe wildland fires in owl habitat.

Within the Forest Service's Region 3, Southwest Region (including the Coconino National Forest), National Forest Plans were amended in 1996 to incorporate management recommendations presented in the 1995 Recovery Plan for the Mexican spotted owl. Since the 1995 Recovery Plan was published, our knowledge has increased. Given these changes and new information, it is now clear that managing according to the 1995 Recovery Plan does not facilitate recovery of the owl given high fire risk. The overriding effect of this Forest Plan amendment will be to facilitate management to reduce risk of severe fire hazard in and adjacent to MSO habitat and thus it is expected to more effectively contribute to MSO recovery in the project area over the next several decades.

Amendment 2: The effects of treatments on slopes > 40 percent are analyzed for each species in the following report. This amendment would allow equipment to operate on steep slopes. The use of steep slope equipment with enclosed cabs allows for people to be protected from potential falling trees reducing the need to cut hazard trees to insure their safety. This amendment allows us to better meet the desired future conditions for wildlife.

Threatened, Endangered and Forest Service Sensitive (TES) Wildlife Species

The following TES species were analyzed because they are present or have habitat in the FWPP Action Area (Table 2). The Action Area is the project area and ½ mile buffer around the project.

Table 2 List of TES wildlife species that are present or have habitat in the FWPP action area

Common Name	Scientific Name	Status
Birds		
Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Bald eagle	*Haliaeetus leucocephalus*	FS Sensitive
Northern goshawk	*Accipiter gentilis*	FS Sensitive
American peregrine falcon	*Falco peregrinus anatum*	FS Sensitive
Mammals		
Navajo Mogollon vole	*Microtus mogollonensis navajo*	FS Sensitive
Allen's lappet-browed bat	*Idionycteris phyllotis*	FS Sensitive
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	FS Sensitive
Spotted bat	*Euderma maculatum*	FS Sensitive
Amphibians		
Northern leopard frog	*Rana pipiens*	FS Sensitive

The following wildlife species were not analyzed for this project because there is no suitable or potential habitat for these species within the FWPP action area. The Action Area is the project

area and ½ mile buffer around the project.

Table 3 List of TES wildlife species that are not present and do not have habitat in the FWPP action area.

Common Name	Scientific Name	Status	Reason for Not Including in Analysis
Birds			
Burrowing owl (western)	*Athene cunicularia hypugaea*	FS Sensitive	No suitable habitat. Requires grasslands with burrows present.
Mammals			
Black-footed ferret	*Mustela nigripes*	Endangered	No suitable habitat. Requires grasslands with prairie dog towns or complexes of >200 acres in size. A complex consists of two or more neighboring towns within 4.3 miles of each other.
Western red bat	*Lasiurus blossevillii*	FS Sensitive	No suitable habitat. Requires deciduous riparian habitat.
Reptiles			
Narrow-headed gartersnake	*Thamnophis rufipunctatus*	Federal Candidate	No suitable habitat. Requires perennial water.
Northern Mexican gartersnake	*Thamnophis eques megalops*	Federal Candidate	No suitable habitat. No perennial or spatially intermittent streams. No aquatic habitat supporting native fishes.

Mexican Spotted Owl (*Strix occidentalis lucida*)

Analysis Methods

The following evaluation criteria were used to compare environmental consequences for alternatives:

- Change in Crown Fire Potential within MSO habitats
- Protected and Recovery Habitat Quality – Measures are primary constituent elements as identified for critical habitat which include; a range of tree species, canopy closure/cover, tree sizes suggestive of uneven-aged management and large dead trees (snags) with a diameter of 12 inches or greater.
- Prey Habitat – Measures are primary constituent elements as identified for critical habitat which include; volumes of fallen trees and other woody debris, plant species richness, including hardwoods, residual plant cover to maintain fruits, seeds, and regeneration to provide needs of MSO prey species.
- Noise disturbance associated with project implementation.

Existing Conditions

On the Coconino National Forest, the Mexican spotted owl (MSO) occupies mixed conifer and ponderosa pine/Gambel oak vegetation types, usually characterized by high canopy closure, high stem density, multi-layered canopies within the stand, numerous snags, and downed woody material.

Mexican spotted owls are nocturnal predators that feed primarily on small mammals. They are “perch and pounce” predators that locate prey from an elevated perch by sight or sound, then pounce on the prey and capture it with their talons. They consume a variety of prey throughout their range, but

commonly eat small and medium-sized rodents such as woodrats, peromyscid mice, and microtine voles. They also eat bats, birds, reptiles, and arthropods.

The project area contains both MSO protected and recovery habitats. All of the suitable MSO habitat on the FWPP project has been surveyed. Surveys were done to USFWS protocols as described in the MSO Recovery Plan (USFWS 2012). Existing acres of MSO habitat are summarized in Table 4 and Table 7.

Protected Habitat (PACs)

There are ten Protected Activity Center (PACs) totaling 3,955 acres within the project area. Of that area, approximately 20 percent are nest/roost cores. PAC acres are summarized in Table 4 and displayed in Figure 1 (Dry Lake Hills) and Figure 2 (Mormon Mountain).

Table 4: Summary of acreages of MSO PACs and core areas in the project area

Habitat Type	Description	PAC*	Nest/Roost Core
Mormon Mountain	De Toro's (#030405033)	661	104 and 82
	Lockwood (#030405041)	149	0
	Moore Well (#030405011)	21	7
	Mormon Mountain (#030405051)	148	0
	Mormon Mountain North (#030405008)	610	109
Dry Lake Hills	Weimer Springs (#030405032)	582	101
	Schultz Creek (#030402006)	659	122
	Mount Elden (#030402002)	630	102
	Orion Spring (#030402035)	328	150
	Weatherford 2 (#030402039)	163	8
	Total	**3955**	**785**

*PAC acres include nest/roost core

Additional PACs, not already listed above, that are within the Action Area defined in this report include: Archie's (#030405034), Red Raspberry (#030405003), Dairy Spring (#030405007) and Aspen Spring (#030402035).

One of the primary concerns for MSO is the potential loss of habitat from uncharacteristic wildfire. Crown fire potential was analyzed for both project areas using data generated from modeling performed using FlamMap 5.0. Three types of fires result from the modeling. Surface fire describes fire that burns through the surface fuels of the forest floor. This type of fire has the least active of fire behaviors and is the most beneficial of the three types of fires in maintaining the historical, ecological role of low intensity, high frequency fire in the southwestern ponderosa pine ecosystem. Passive crown fire, or torching, occurs when flame lengths are long enough to reach the lower edge of the canopy and can result in individual or small group tree torching but does not proliferate through the forest canopy through continuous crown fire spread. Active crown fire occurs when flames reach the forest canopy and spreads through it with intensity and continuity (Fire & Fuels Specialist Report). Table 5 and Table 6 summarize the Crown Fire Potential by fire type for MSO habitats with the project as modeled under Schultz Fire Weather Conditions (see Fire & Fuels Specialist Report for more information).

Table 5: Active crown fire potential in MSO habitats in Dry Lake Hills

Dry Lake Hills (Schultz Wildfire Weather Conditions)								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	**Total**
Recovery Mixed Conifer		622	35%	187	11%	962	54%	1771
Recovery - Nest/Roost		55	51%	23	21%	30	28%	109
Recovery Pine Oak		107	39%	31	11%	135	49%	274
Protected PAC	Mt Elden	114	18%	62	10%	454	72%	630
Protected PAC	Orion Spring	150	46%	26	8%	150	46%	326
Protected PAC	Schultz Creek	118	18%	97	15%	443	67%	658
Protected PAC	Weatherford2	34	21%	20	13%	107	66%	162

Table 6: Active crown fire potential in MSO habitats for Mormon Mountain project area

Mormon Mountain (Schultz Wildfire Weather Conditions)								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	Total
Recovery Pine Oak		132	17%	14	2%	618	81%	764
Recovery Nest/Roost		1	5%	0	0%	21	95%	22
Protected PAC	Weimer Springs	196	34%	19	3%	367	63%	582
Protected PAC	Mormon Mountain North	147	24%	57	9%	406	67%	610
Protected PAC	Mormon Mountain	52	35%	2	1%	94	64%	148
Protected PAC	Moore Well Rock Dike	7	31%	2	7%	13	61%	21
Protected PAC	Lockwood	51	34%	1	1%	97	65%	149
Protected PAC	De Toros	133	20%	83	13%	445	67%	660

Approximately 65 percent of the protected habitat in the Dry Lake Hills project area and 66 percent in the Mormon Lake project area was rated as having an Active Crown Fire, indicating that wildfire activity would result in more severe effects to ecosystem components than should occur for the natural fire regime.

Protected habitat is characterized by percent of basal area by size class and trees per acre greater than 18 inches diameter as well as the amount of course woody debris and snags greater than 18 inches dbh. As summarized in the Silviculture Specialist Report, all of the protected habitat exceeds basal area minimums in large size classes with adequate number of large trees. On average, stands have

less than half of their stand densities in young trees greater than12 inches dbh. On average, approximately one-half to three-quarters of their stand densities are in the 12-18 inch dbh size class. Course woody debris exceeds desired conditions in all protected habitat and snags greater than 18 inches dbh meet desired conditions in all areas except the pine/oak in the Mormon Mountain project.

Recovery Habitat

As shown in Table 7 and depicted in Figure 1 (Dry Lake Hills) and Figure 2 (Mormon Mountain), recovery habitat consists of 1,909 acres of mixed conifer and 1,066 acres of pine/oak. The project area does not contain any riparian habitats (Hydrology Specialist Report).

Table 7: Acreages of MSO Recovery Habitat within the Project Area

Habitat Type	Description	Acres of Recovery Habitat	Acres of Recovery Nest/Roost	Total Recovery Habitat
Mixed Conifer Recovery Habitat Outside of PACs	Dry Lake Hills	1800	109	1909
	Mormon Mountain	0	0	0
	Total	**1800**	**109**	**1909**
Pine-Oak Recovery Habitat Outside of PACs	Dry Lake Hills	277	0	277
	Mormon Mountain	767	22	789
	Total	**1044**	**22**	**1066**
Riparian Recovery Habitat Outside of PACs	Dry Lake Hills	0	0	0
	Mormon Mountain	0	0	0
	Total	**2844**	**131**	**2975**

Table 5 and Table 6 list the portion of recovery habitat with each fire type rating. Approximately 54 percent of the mixed conifer and 49 percent of the ponderosa pine recovery habitat in the Dry Lake Hills project area and 81 percent of the ponderosa pine recovery habitat in the Mormon Lake project area was rated as having an Active Crown Fire, indicating that wildfire activity would result in more severe effects to ecosystem components than should occur under the natural fire regime.

Recovery habitat is characterized by basal area and percent of basal area of trees 12-18 inches dbh and trees per acre greater than 18 inches diameter as well as the amount of course woody debris and snags greater than 18 inches dbh. As discussed in the Silviculture Specialist Report, all of the recovery habitat exceeds basal area minimums in large size classes with adequate number of large trees. On average, stands have less than half of their stand densities in young trees < 12 inches dbh. On average, approximately one-half to three-quarters of their stand densities are in the 12-18 inch size class. On average, course woody debris exceeds desired conditions in all recovery habitats and snags greater than 18 inches dbh meet desired conditions in all areas except the pine/oak in both project areas.

Forested areas in recovery habitats currently do not provide a sustainable level of owl nest/roost habitat distributed across the landscape. These conditions do not provide for replacement owl nest/roost habitat because current conditions inhibit recruitment of old-growth trees, thereby not favoring the creation of large snags in stands and accumulation of large down logs and woody debris on the forest floor over time. The dense overstory is preventing development of a structurally and biologically diverse assemblage of tree and understory species. Lack of stand diversity prohibits conditions that support a wide variety of prey species for MSO.

Recovery Nest/Roost Habitat

The 2012 Recovery Plan calls for 25 percent of mixed conifer recovery habitat to consist of nest/roost habitat, having a minimum basal area of 120 ft2 with at least 12 trees per acre greater than 18 inches

dbh, and 10 percent of pine oak restricted habitat having a minimum basal area of 110 ft2 with at least 12 trees per acres greater than 18 inches dbh[1]. For the ponderosa pine, nest/roost stands were identified in previous decisions or as part of the Four Forest Restoration Initiative (4FRI). For the mixed conifer, nest/roost stands have been identified through previous decisions and as part of a District-wide Assessment (USFS 2013). Approximately 131 acres of recovery nest/roost habitat occur within the project. Active Crown Fire Potential within recovery nest/roost habitat is 95 percent in Dry Lake Hills and 28 percent in Mormon Mountain project area (Table 5 and Table 6).

Designated Critical Habitat

Critical habitat is designated by the U.S. Fish and Wildlife Service (FWS) to provide for the survival and recovery of listed species. For MSO, critical habitat includes areas within mapped boundaries of protected and recovery habitat and includes one or more of the primary constituent elements as listed in the Federal Register (USDI 2004). Critical habitat is in Upper Gila Mountains (UGM) Recovery Unit 14Critical habitat includes protected and recovery habitats within the USFWS-designated Critical habitat boundary.

Approximately 6,930 acres of critical habitat are within the project area and consists of 3,955 acres of protected habitat, 2,975 acres of recovery habitat and the remainder is other forest and woodland. Refer to the discussion under *Protected Activity Centers* for a description of conditions within protected habitat and refer to the discussion under *Recovery and Recovery Nest/Roost Habitat* for a description of conditions within recovery habitat. Table 8 summarizes critical habitat by habitat and project area.

Table 8: Critical Habitat within the FWPP Project Area

Habitat Type	Dry Lake Hills	Mormon Mountain	Project
Protected	1781	2174	3955
Recovery (Pine Oak)	277	789	1066
Recovery (Mixed Conifer)	1909	0	1909
Total	3967	2963	6930

[1] The 1987 Forest Plan identifies pine oak nest/roost habitat having a minimum basal area of 150ft2 with at least 20 trees per acres greater than 24 inches dbh.

Figure 1 Dry Lake Hills MSO Habitats

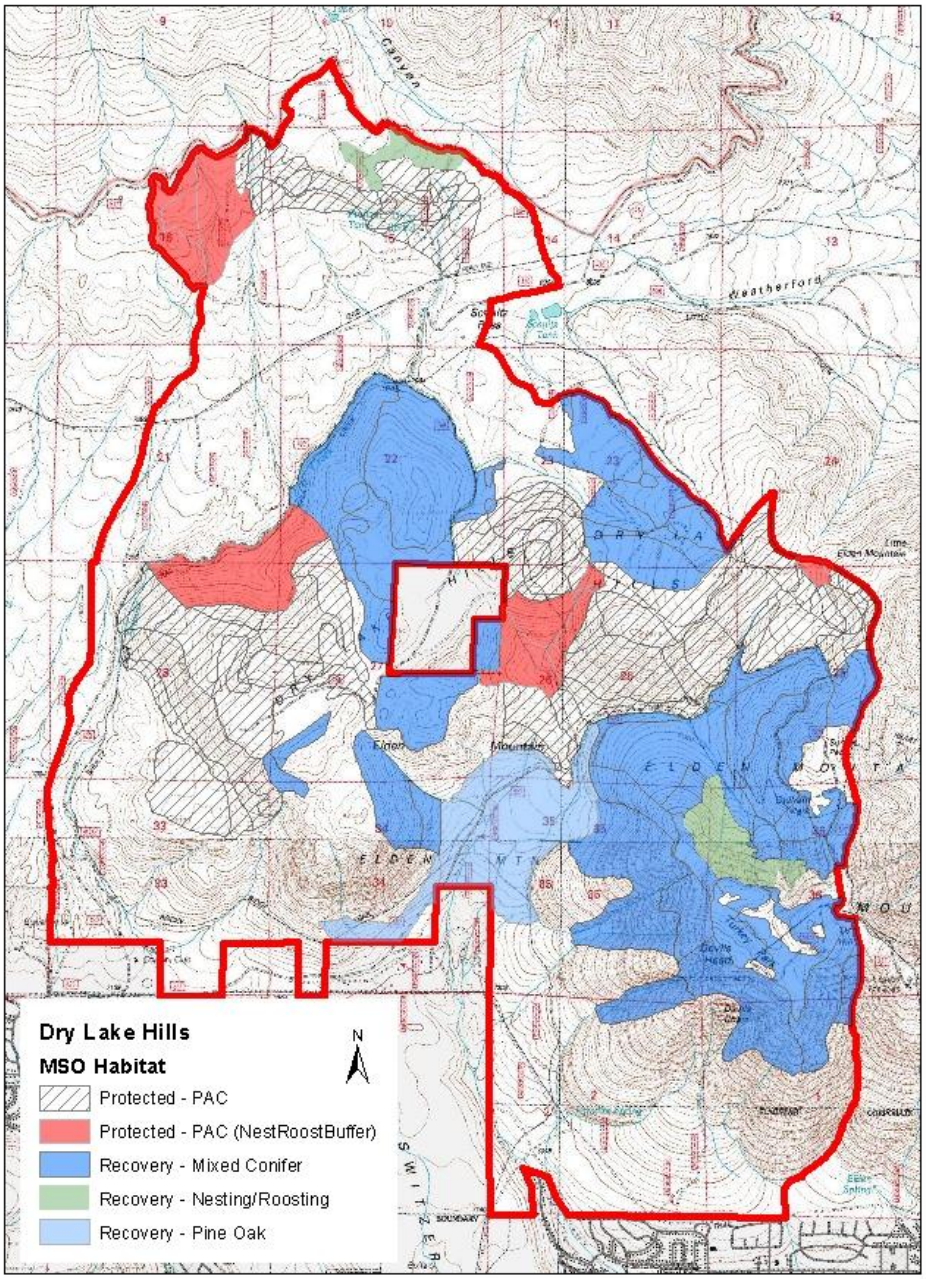
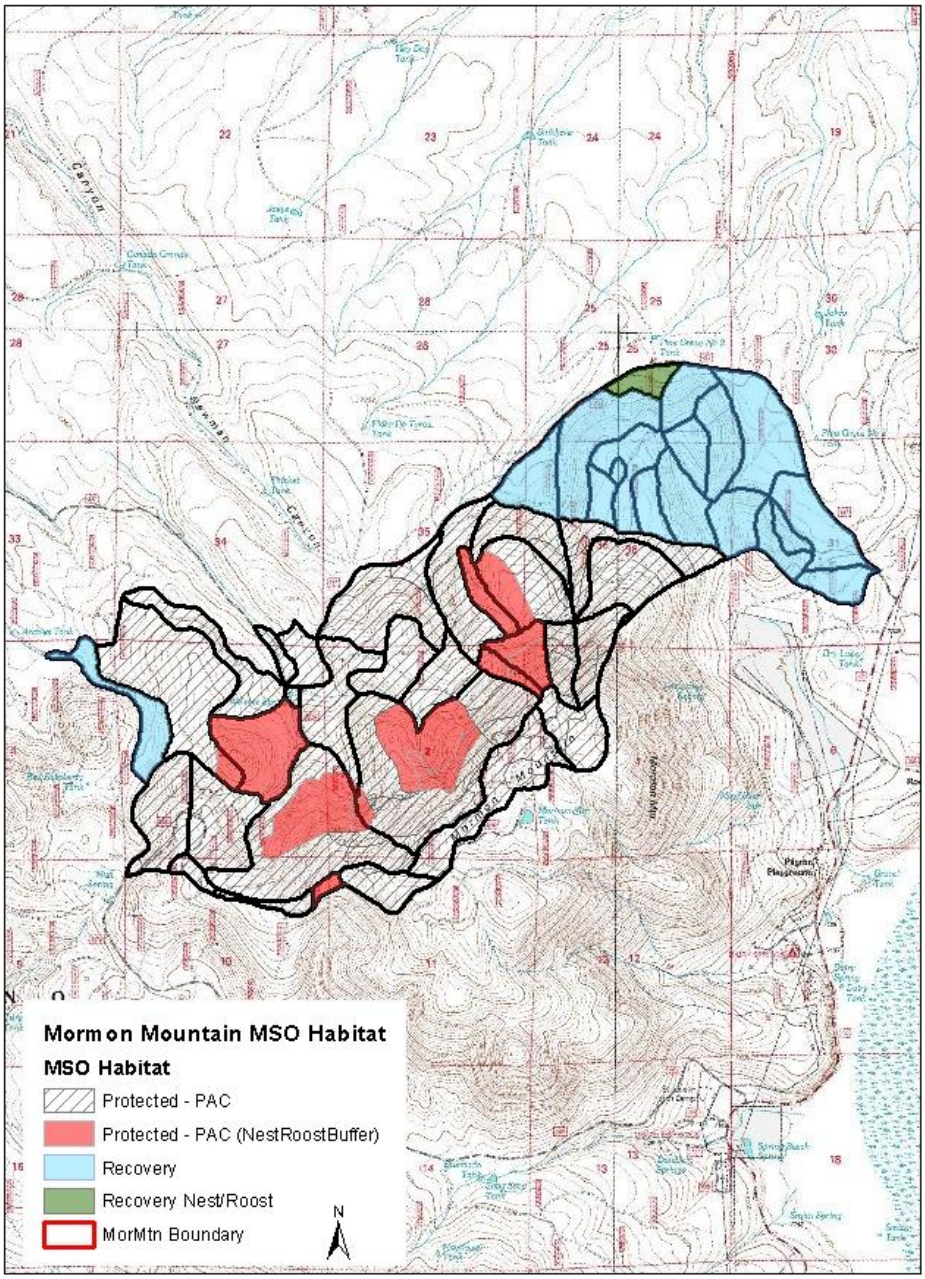


Figure 2 Mormon Mountain MSO Habitats



Alternative 1 – No Action Alternative

Direct and Indirect Effects

Habitat conditions for MSO would remain in their current condition, notwithstanding natural processes. Under the No Action Alternative, there would be no direct effect on MSO however there would be substantial indirect effects. Dense forest conditions would exist and the crown fire potential would continue to place MSO habitat at risk with respect to stand-replacing fire. If a crown fire were to occur in MSO habitat, components for nesting, roosting and foraging would be reduced or eliminated, resulting in an indirect adverse effect. In addition, tree densities would continue to be high, slowing their growth into larger diameter classes and thereby limiting habitat for prey. Lastly, recent studies have shown a pervasive increase in tree mortality rates in old forests, which is interpreted as symptomatic of forests that are stressed and vulnerable to abrupt dieback (Ganey and Vojta 2011, Van Mantgem et al. 2009). Most recently this has been a result of bark beetle outbreaks and the combined effects of pests, disease, and drought that have resulted in nearly complete mortality of large trees in some cases (Van Mantgem et al. 2009). Without some type of management intervention, it is expected that forests will experience increasing stress, which would likely presage substantial changes in forest structure, composition, and function that would greatly impact MSO habitat needs (Notaro et al. 2012, Van Mantgem et al. 2009, Ganey and Vojta 2011).

If a ground fire occurred, it is likely that ladder fuels would carry fire into the dense canopies and turn into a passive or active crown fire. The No Action Alternative would not move to develop or maintain MSO habitat components.

Cumulative Effects

The cumulative effects boundary for MSO is the action area, defined as the project area and a one-half mile buffer around the project. Activity effects over one-half mile from the project boundary diminish to very low levels and would not impact owls within the project (i.e noise disturbance, smoke accumulations) and therefore would not combine with effects from this project. The time period analyzed for cumulative wildlife effects include a 20 year time period (2013 to 2033). The No Action Alternative would maintain or result in an increase in the current fire risk to MSO habitat and adjacent forest lands. The main effects to owls from this project are related to the adverse effect of noise disturbance from implementation and short term habitat effects and the long term beneficial effect of improved habitat conditions . All project implementation including maintenance burning is expected to be completed by 2033 and the desired forest structure in MSO habitat would develop within this period.

Under Alternative 1 there would be no affect from disturbance during implementation however; Alternative 1 would not prevent, delay, or ameliorate predicted effects of climate change, but would likely result in a continued trajectory toward increased stressors on the MSO . The dense forest conditions resulting from the no action alternative are at a high risk to density related and bark beetle mortality and have limited resilience to survive and recover from potential large scale impacts. Under warmer weather conditions and more frequent and severe droughts predicted for the Coconino National Forest (TACCIMO 2014), the potential impacts of these risks to the ecosystem would be increased. Individual tree growth would be limited to the point of stagnation. As tree density increases, many areas would experience higher mortality (Notaro et al. 2012, Van Mantgem et al. 2009, Ganey and Vojta 2011). Species, including the MSO, requiring closed canopy forest conditions or old or large tree, snag, and log structure would be negatively impacted in the long-term. This would combine with the loss of habitat from the adjacent Schultz Fire, the subsequent waterline project, and the Mormon Mountain powerline replacement project to further reduce MSO habitat quality.

The ability to retain sustainable and resilient ecosystems would be further compromised by vulnerability to high-severity fires. The overt threat of high-severity fire could limit options for treating uncharacteristic fuel loads through the use of unplanned ignitions, compounding the fire risk through time.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Treatments were designed to move toward desired conditions as identified in the 2012 Mexican Spotted Owl Recovery Plan (MSO Recovery Plan) (USFWS 2012). Appendix A, Table 1 describes the desired conditions and objectives for each of the proposed treatments. Table 9 below lists the acres of treatments in MSO habitat.

Treatments follow the MSO Recovery Plan (USFWS 2012) in protected and recovery habitats with two exceptions: 1) trees greater than 24 inches dbh would be cut for cable corridors and 2) work would need to be completed in PACs during the breeding season to reduce the duration of disturbance from implementation.

Proposed Treatments in MSO Habitat

Table 9 lists the proposed treatments in MSO protected and restricted habitat under Alternative 2.

Table 9: Alternative 2 acres of thinning and/or burning proposed in MSO habitat

Treatment	Protected Habitat	Recovery Habitat
Mixed Conifer Fuels Reduction	0	1140
Mixed Conifer Fuels Reduction Burn Only	0	138
Mixed Conifer Fuels Reduction Hand Thinning	0	132
Ponderosa Pine Fuels Reduction Hand Thinning	0	14
Ponderosa Pine Fuels Reduction	0	1029
MSO PAC Fuels Reduction (wet mixed conifer)	180	0
MSO PAC Fuels Reduction	2759	0
MSO PAC Fuels Reduction- Hand Thinning	202	0
MSO Nest Fuels Reduction-Burn Only	663	0
MSO Nest Fuels Reduction- Hand Thinning	122	0
MSO Recovery Nest/Roost Hand Thin	0	94
MSO Recovery Nest/Roost Burn Only	0	37
Totals	3926	2584

Protected Habitat

Approximately 3926 acres of protected habitat (PACs) (99 percent of protected habitat within the project) is proposed for thinning and/or burning treatments intended to abate fire risk. Of that, approximately 122 acres are within the Schultz nest core, where trees would be thinned up to 5 inches dbh and dead and down material would be piled by hand and burned. Approximately 20 percent of the Schultz nest core would be deferred from treatment to maintain pockets of denser trees intended to provide more structural diversity for prey. Additionally, 663 acres are nest cores that would be a burn only treatment. No temporary roads would be constructed within nest cores; however there would be approximately 4.7 miles of temporary roads constructed within protected habitat and another 0.9 miles of road reconstruction (Table 24).

Recovery Habitat including Nest/Roost

Under Alternative 2, 2,315 acres (78 percent of the MSO recovery habitat, within the project)

would be treated with mixed conifer or ponderosa pine fuels reduction treatments. Approximately 131 acres of recovery habitat (4 percent of MSO recovery habitat, within the project area), including 94 acres of recovery nest/roost, would be hand thinned uneven-aged management with broadcast burning. An additional 138 acres of recovery and 37 acres of recovery nest/roost would be a burn only treatment.

Previous analysis has identified 131 acres as recovery nest/roost. These 131 acres of recovery habitat would be treated to develop into nest/roost habitat. No temporary roads would be constructed in recovery nest/roost habitat however; there would be approximately 7.0 miles of temporary road construction within recovery habitat and another 0.9 miles of road reconstruction (Table 13) in order to accomplish thinning treatments. These roads would be rehabilitated after harvesting has been completed.

Designated Critical Habitat
Under Alternative 2, 3,926 acres of protected habitat and 2,584 acres of recovery habitat would be treated within Critical Habitat as listed above.

Effects of Thinning and Prescribed Burning
Under Alternative 2, all treatments in MSO habitats would be designed to move toward the desired conditions as identified in the MSO Recovery Plan and described in Appendix A, Table 1. Modeling shows that the treatments would move toward development of desired conditions both immediately after treatment and continuing over the next 20 to 40 years (Silviculturalist Specialist Report). Treatments would be designed to maintain large snags, large logs and develop trees into the larger size classes. Snags would not be targeted for removal except where necessary for cable corridor locations and safety requirements in areas where trees would be felled by hand and removed by cable. Trees greater than 18 inches dbh would not be cut in protected habitat and trees greater than 24 inches dbh would not be cut in recovery habitat except where necessary for cable corridor locations (see next paragraph). Under Alternative 2, a Forest Plan amendment would allow for the removal of these trees in MSO habitat for cable corridors needed to facilitate skyline (a.k.a. cable) logging of steep slopes.

Skyline logging uses a system of cables to drag logs of whole trees from the cutting unit to a roadside landing. It is used on sites that are too steep for ground based operations. Roughly parallel "corridors" for the skyline needs to be placed every 100 to 140 feet. These corridors are approximately 12 feet wide and must have all trees removed from them to facilitate yarding. Much of this area contains large (greater than 24 inches dbh) pre-settlement trees and snags. Roughly 74 acres (2% of protected habitat within the project) of protected habitat and 91 acres (3% of recovery habitat within the project) of recovery habitat would be denuded by cable corridors (i.e. located within the corridors themselves). The Recovery Plan guidelines are to retain large trees (greater than 18 inches dbh) in protected habitat and retain trees greater than 24 inches dbh in recovery habitat. This alternative would remove roughly 132 trees greater than 18 inches dbh in 2 percent of MSO protected habitat within the project (24 MM and 108 DLH) and 74 trees greater than 24 inches dbh in recovery habitat (Dry Lake Hills). No cable corridors are proposed in MSO recovery habitat on Mormon Mountain, however cable corridors are proposed in MSO PACs on Mormon Mountain.

In addition, cable logging requires that all hazard trees be removed from the entire area that would be cable logged to provide for safety of personnel on the ground outside of protected (closed cab) machinery. A design feature requires biologists to identify patches of snags up to 10 acres in size to allow for retention of some snags in these areas. Not taking into account these patches, there would be approximately 391 acres (9% of the protected habitat within the project) in protected habitat and 423 acres (14% of the recovery habitat within the project) of recovery habitat where

all snags could be removed to provide for safety. This loss of snags would reduce these key habitat components in protected and recovery habitats moving away from desired conditions. This would likely move away from desired conditions for snags within the ponderosa pine in MM protected habitat and for ponderosa pine in both MM and DLH recovery habitat, however mixed conifer in both projects would continue to meet desired conditions.

This alternative would lead to a loss of more MSO key habitat components with a loss of more snags and trees greater than 18 inches dbh than any other action alternative. Table 10 summarizes the approximated loss of key habitat components within MSO habitats within areas cable logged, including cable corridors. Although there would be a loss of trees >18" DBH in cable corridors within protected habitat and > 24" DBH in recovery habitat when averaged across the cable treatment areas there are still ample large trees to meet the desired conditions in the ponderosa pine within MSO protected and recovery habitat after treatment. Snags would move further away from desired conditions within the areas treated by cable logging. Design features such as retaining snag patches, large trees with dead tops, cavities, and lighting strikes wherever possible will provide for replacement snags. Snags would be created if monitoring determines a deficit in these key areas.

Table 10: Alt. 2 Loss of MSO Key Habitat Components within Areas Cable Logged including Cable Corridors

Project Area	Recovery Habitat No. Trees >24" DBH Removed	Protected Habitat No. Trees >18" DBH Removed	Recovery Habitat No. Snags Removed	Protected Habitat No. Snags Removed
MM	0	24	12"-18" - 0	12"-18" -306
			>18" - 0	>18" - 34
DLH	206	108	12"-18" -1163	12"-18" -927
			>18" -857	>18" -707

Thinning and/or prescribed burning activities in MSO habitat may indirectly affect MSO by changing the owl's habitat structure including snags, downed logs, woody debris, multi-storied canopies, and dense canopy cover. There is a potential for owls to relocate because of disturbance during treatment activities. The proposed thinning and burning may change the structure of MSO prey species' habitat, affecting the abundance and composition of prey species. Although treatments, especially prescribed burning, may have varying effects to prey species in the short-term (generally one year, depending on climate and moisture) by impacting individuals of prey species due to disturbance of prey species' habitat, the proposed treatments may increase the diversity of vegetative conditions, which in turn would provide for a diverse prey base. Empirical models of factors that influence availability of Mexican spotted owls five common prey species indicate that microhabitat manipulation can influence abundance of the Mexican vole, followed by the long-tailed vole, Mexican woodrat, deer mouse and lastly the brush mouse (Ward 2001). Ward (2001) found that the total available biomass (kg) of mice and voles provided the strongest correlation with reproductive output. Model results indicated that abundance (g/ha) of the two vole species could be influenced by manipulating grass-forb height, whereas abundance of Mexican woodrats, the preferred prey, might be influenced by promoting shrub diversity and increasing large log cover.

Table 11 and 12 below summarize the post-treatment Crown Fire Potential for Dry Lake Hills and Mormon Mountain. Crown Fire Potential after implementation of Alternative 2 would greatly reduce the potential for active crown fire in each of the four PACs in the Dry Lake Hills and all of

the recovery habitat in this area and at the same time shift the majority of the habitat to crown fire potential of surface fire. The largest benefit in PACs would occur in the Schultz PAC where thinning is proposed within the nest core. For the Mormon Mountain project area crown fire potential after implementation of Alternative 2 would greatly reduce crown fire potential in each of the six PACs and all of the recovery habitat also shifting a majority of the acres to a surface fire rating.

Overall, this shift in fire type from active to surface will result in the majority of MSO habitat in the project area to be in a condition where low intensity, frequent fire would occur maintaining the historical, ecological role of fire.

Under Alternative 2, the percentage of protected and recovery habitat with active crown fire potential is reduced mitigating the risk of large wildfires. The following tables reflect the change in crown fire potential within protected and recovery habitats.

Table 11: Alternative 2 Post Treatment Crown Fire Potential

Dry Lake Hills (Schultz Wildfire Weather Conditions) ALT2								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	**Total**
Recovery - Mixed Conifer		1539	86%	39	2%	194	11%	1793
Recovery - Nesting/Roosting		109	100%	0	0%	0	0%	109
Recovery - Pine Oak		275	99%	3	1%	0	0%	278
Protected - PAC	Mt Elden	450	72%	4	1%	174	28%	628
Protected - PAC	Orion Spring	311	95%	4	1%	12	4%	327
Protected - PAC	Schultz Creek	578	88%	1	0%	102	15%	660
Protected - PAC	Weatherford2	130	81%	8	5%	23	14%	161

Table 12: Alternative 2 Post Treatment Crown Fire Potential

Mormon Mountain (Schultz Wildfire Weather Conditions) ALT2								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	Total
Recovery		623	82%	136	18%	1	0%	761
Recovery Nest/Roost		22	99%	0	1%	0	0%	22
Protected - PAC	Weimer Springs	559	96%	14	2%	7	1%	580
Protected - PAC	Mormon Mountain North	512	84%	93	15%	5	1%	610
Protected - PAC	Mormon	137	93%	10	7%	0	0%	147

	Mountain							
Protected - PAC	Moore Well/Rock Dike	16	77%	5	23%	0	0%	21
Protected - PAC	Lockwood	150	100%	0	0%	0	0%	150
Protected - PAC	De Toros	573	87%	69	11%	14	2%	657

By treating recovery habitat with a mixed conifer or ponderosa pine fuels reduction treatment and prescribed fire, wildfire-induced mortality of key habitat components in recovery habitat would be reduced for the next several decades. In thinning areas there would be an increase in short-term fire hazard in areas where slash needs to be cured for a year or two before burning, but treatments would decrease fire hazard for several decades after thinning and burning treatments are complete.

Throughout the project, during broadcast burning activities, torching may occur within treatment areas. This torching is expected to create small openings of less than an acre in size, however a change in the stand structure from this type of event would not be detectable on a stand basis. Torching would mimic gap processes that occur under natural conditions (historic wildfire, windfall, and historic pest and disease outbreaks). Broadcast burning would decrease course woody debris in all protected and recovery habitat treatments; however, levels would range from 4 to 21 tons/acre and would exceed Forest Plan requirements. Woody debris and snags are habitat for small mammals. Indirect effects of reducing woody debris due to broadcast burning would decrease prey base abundance on a short-term basis for approximately one year (Jenness 2000). This decrease in small mammal prey base could be compounded during drought years when the prey base is lower due to a lack of food for these animals. However, herbaceous vegetation typically responds favorably to broadcast burning, and an increase in forage for small mammals is expected, outside of drought conditions. This in turn would have a corresponding increase in the small mammal prey base (Jenness 2000). Design features to protect snags and logs would reduce the number of snags and logs burned through a combination of burning techniques and lining (see Design Features). Recruitment snags would be identified from live trees that exhibit defects ideal for wildlife. For example, trees with spiked tops, lightning strikes, mistletoe brooms, or fading crowns. All trees greater than 18 inches DBH cut for cable logging would be left in place.

Smoke from broadcast and pile-burning may temporarily disturb MSOs. Burning would be managed to minimize the accumulation of smoke in PACs during the breeding season (see Design Features). Short-term impacts from smoke would be reduced by coordination and timing and type of burning with wind direction, topography, time of year, and distance to PACs. Initial entry burning would not occur in nest cores during the breeding season and burning would be restricted during the breeding season in areas that may create smoke impacts to occupied PACs. Prevailing southwest winds and the topography of the area typically act to lift smoke, carrying it away from ignitions sites. PACs on Dry Lake Hills and Mormon Mountain are on raised topographic features and are not expected to have smoke settle in them long enough to cause discernable effects to MSOs because of air movement in these landscape-scaled features. With this information in mind, along with the concept that the species presumably adapted and evolved with smoke from wildland fire, smoke-related effects from maintenance burning would not be substantial.

Under Alternative 2, there would be indirect effects from the modification of vegetation. Burning, thinning and the associated ground disturbance could adversely affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from fire. However, over the long- term, an increased diversity of vegetative structural stages and improved understory vegetation with improved plant species richness and would increase prey species, resulting in indirect beneficial impacts.

Effects of Ground Disturbance

Ground disturbance can cause indirect effects from the loss of vegetation through compaction and rutting and exposure of bare mineral soil. Landings, cable corridors, road construction and decommissioning, and other harvest activities could adversely affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat. The following excerpt by the Kaibab Forest's Soil Scientist estimates the percent of disturbance by harvesting type in Arizona ponderosa pine forest on slopes less than 40 percent:

"Mechanical thinning of the ponderosa pine forests of Arizona has been occurring since the 1980s mainly through whole tree harvesting on slopes less than 40%. Typical equipment used for such harvesting includes rubber-tired feller bunchers and rubber-tired skidders with tracked dozers used for piling of slash. The amount of disturbance as a percentage of a typical harvest unit (i.e., area included in a timber sale) impacted by compaction, rutting, and/or exposure of bare mineral soil from this type of harvesting has been estimated to be roughly 8% associated with feller-buncher and skidding operations, 3% associated with machine piling of slash, 3% associated with landings, and 3% associated with temporary roads (MacDonald, 2013)." This alternative's use of cable logging would mostly avoid ground disturbance from heavy machinery on steep slopes, and thus would generally prevent compaction, rutting, and/or exposure of bare mineral soil on slopes greater than 40 percent in the project area.

Of the 5,203 acres of ground based harvest method in MSO habitat, approximately 2,777 acres are protected habitat and 2,426 are recovery habitat. Roughly 728 acres (14 percent) could be impacted by compaction, rutting, and/or exposure of bare mineral soil. All harvest methods would require temporary roads, which would result in additional acres that would be impacted by compaction and exposure of bare mineral soil. Temporary roads, including those along an existing road prism, road reconstructions and cable corridors needed for implementation have been identified and are summarized in Table 13.

Table 13: Alternative 2 - Miles/Acres of Cable Corridors, Temp and Relocated Roads in Protected and Recovery Habitat

	Acres treated by the Skyline/ Excaline Harvest Method*	Acres of Cable Corridors Skyline/ Excaline	Miles of Temp Roads/Road Reconstruction
DeToros PAC	39	5	.6/.1
Lockwood PAC	12	2	.2/0
Moore Well- Rock Dike PAC	0	0	0/0
Mormon Mountain PAC	0	2	.9/.4
Mormon Mountain North PAC	56	7	.8/.4
Weimer Springs PAC	0	0	0/0
Schultz Creek PAC	115	18	1.2/0
Mount Elden PAC	180	31	.9/0
Orion Spring PAC	49	7	.1/0
Weatherford2 PAC	14	2	0/0
Total Miles/Acres in	**465 acres**	**74 acres**	**4.7/.9 miles**

	Acres treated by the Skyline/ Excaline Harvest Method*	Acres of Cable Corridors Skyline/ Excaline	Miles of Temp Roads/Road Reconstruction
PAC			
Recovery Habitat	DLH- 514 MM - 0	DLH-91 MM-0	DLH-6.1 /.9 MM – .9/0
Recovery Nest/Roost	DLH – 0 MM - 0	DLH-0 MM-0	DLH- 0/0 MM – 0/0
Total Miles/Acres in Recovery	**514 acres**	**91 acres**	**7/.9 miles**
TOTAL	**979 acres**	**165 acres**	**11.7/1.8 miles**

*Acres treated by Skyline/Excaline harvest method include cable corridors

No temporary roads would be constructed in MSO nest cores, reducing the potential for adverse effects to nesting owls. Temporary roads, landings and skid trails would be needed in PACs and recovery habitats in order to accomplish thinning treatments; however all would be rehabilitated after harvesting. This alternative would have 4.7 miles of temporary roads in protected habitat and 7.0 miles in recovery habitat. The construction of temporary roads would remove important habitat components such as large trees, snags, and downed wood on approximately 8.0 acres (assuming a 14-foot wide road) in protected habitat, and 15.3 acres in recovery habitat. Road reconstructions would be needed in order to accomplish thinning treatments with 0.9 mile in protected habitat and 0.9 mile in recovery habitat (affecting approximately 1.6 acres each).

Ground disturbance associated with landings, temporary roads, cable corridors and ground based harvest activities would be short term and temporary in nature, and although roads, landings and corridors might displace prey they would not limit their numbers in MSO habitats. All ground disturbances would be rehabilitated after implementation. This alternative has the most temporary roads and road reconstructions in protected and recovery habitats of all the action alternatives.

Effects of Disturbance Associated with Project Implementation

Noise disturbance could be caused by project implementation activities including thinning and burning, road construction and maintenance, hauling of logs, and road rehabilitation. In general, human activities have been documented to cause disturbance to raptors and in many instances can cause nest abandonment or changes in home range (Anderson et. al. 1990). Delaney and Grubb (2004) determined that spotted owls appear to be capable of hearing sounds from road maintenance equipment to distances of at least 400 meters (0.25 miles). No mechanical treatments would occur within nest cores. The potential for noise disturbance from hand thinning treatments to directly affect nesting owls would be reduced as no thinning would occur within the Schultz nest core during the breeding season if the nest is active. Treatments within individual PACs would be limited to no more than two breeding seasons (e.g. one entry), reducing the duration of potential disturbance to nesting owls.

Chainsaw operation caused most owls to flush from their perches when chainsaws were operated <60 meters (197 ft) from roosting Mexican spotted owls. Owl response decreased with increasing distance to noise source for chainsaw operation (Grubb 1999). Thinning and logging activities within the PAC but away from nesting locations are not expected to impact nesting success. Activities would occur during daylight hours when owls are typically roosting within the core area

and would be protected from noise both by topographic and vegetative features. Owls are nocturnal and would forage within the PAC during nighttime hours when logging activities would not be occurring. Since disturbance from thinning activities is expected to be minimal during times when owls are active, the impacts from this activity are expected to be minimal. Noise associated with hauling could disturb nesting owls and may occur over for two to three years in Mormon Mountain and five to eight years in Dry Lake Hills. Activities associated with prescribed burning and thinning treatments conducted outside of the breeding season normally do not result in negative effects to the MSO. The MSO habitat within the project area has been surveyed according to approved protocols. Effects from proposed treatments to adult and young owls outside of PACs are unlikely.

Haul routes may cause noise disturbance to nesting owls and vehicles could potentially hit owls, causing injury or death. Most logging traffic would occur during day time hours when owls are not as mobile; however there could be occasions when trucks are operating at times when owls would be foraging in the area. Main haul routes have been identified and include Forest Roads (FR) 420, 556, and 557 for Dry Lake Hills and FR 132, 132A and 648 for Mormon Mountain. FR 420, 132, 132A and 648 pass within a quarter-mile of MSO nest or roost locations, increasing the potential for vehicle-related disturbance to nesting owls and collisions. Hauling of lumber within the Dry Lake Hills may occur within one-quarter mile of the Schultz Creek nest or roost locations during the breeding season. Hauling of logs from Mormon Mountain may occur within one-quarter mile of Weimer Spring, DeToros, Archies, Mormon Mountain and Moore-Well Rock Dike nest and roost locations during the breeding season. For Schultz, Archies, Mormon Mountain and Moore Well-Rock Dike, the haul routes skirt the quarter-mile buffer of known nests and roosts. But for Weimer Springs and DeToros, the 132A haul route cuts through the buffers, increasing the potential for disturbance. There would be an estimated 4,800 truckloads that could haul on these routes. This disturbance would occur consistently (greater than twice per hour) for an extended period of time (greater than an hour) and could influence reproductive success if owls are nesting.

Alternative 2 would mechanically treat 4,697 acres in the Dry Lake Hills and 2,427 acres on Mormon Mountain, which roughly correlates to a maximum of 9,000 and 4,800 truckloads respectively of logs that would potentially be hauled adjacent to these nest cores. Based on a normal operating season of April 15 – November 30 (150-210 days) assuming mechanical treatments accomplish eight acres per day, skyline and excaline yarding accomplish two acres per day, it could potentially take from 5.4 to 7.5 years (breeding seasons) to complete implementation in the Dry Lake Hills and 1.6 to 2.3 years (breeding seasons) to complete implementation on Mormon Mountain.

The MSO monitoring plan is designed to evaluate the effects of prescribed fire and hazardous fuels reduction treatments on spotted owl habitats, and to retain or move towards MSO desired conditions. This monitoring plan would provide valuable information on the effects of these activities on MSO and their habitat.

The Campfire Closure Order would establish a permanent campfire restriction order in the Dry Lake Hills portion of the project area. This would result in a reduction of campfires in and adjacent to MSO habitat limiting the potential for human-caused wildfire to impact these important habitats. This would also reduce wood harvesting associated with campfires reducing the removal of snags and logs, key habitat components for MSO and their prey.

Cumulative Effects

The cumulative effects boundary for MSO is the action area, defined as the project area and a one-half mile buffer around the project. Activity effects over one-half mile from the project boundary diminish to very low levels and would not impact owls within the project (i.e noise disturbance, smoke accumulations) and therefore would not combine with effects from FWPP. The time period

analyzed for cumulative wildlife effects include a 20 year time period (2013 to 2033). The main effects to owls from this project are related to the adverse effect of noise disturbance from implementation and the beneficial effect of improved habitat conditions. All project implementation including maintenance burning is expected to be completed by 2033 and the desired forest structure in MSO habitat would develop within this period. Reviews of all projects (past, present and reasonably foreseeable) that have the potential to impact owls during implementation were analyzed (see Appendix D).

Review with the Forest Service Fuels Specialist concluded that smoke from broadcast and pile burning southwest of the project would have similar short-term (3-5 days) and low intensity (drift smoke) effects of smoke to individual MSO. Burning inside PACs occurs outside the breeding season for most projects. Burning outside of PACs during the breeding season is conducted in a manner that minimizes smoke impacts to MSO. However, it is anticipated that burning activities on portions of this project could occur simultaneously with burning activities on other fuels reduction projects. While there are numerous burning operations planned in areas adjacent to the project area, ADEQ standards limit the total amount of burning allowed in the airshed at a given time. Thus, smoke impacts to PACs are limited and expected to be the same as those analyzed in the direct and indirect effects for this project.

Vegetation treatments proposed for the Four Forest Restoration Initiative (4FRI) will occur within the action area. Several PACs within the action area are proposed for burning. PACs within the action area proposed for vegetation treatment also include Red Raspberry and Archies. Restoration of Weimer Spring is proposed within the Weimer Spring PAC. Recovery nest roost habitat was identified in ponderosa pine as part of the 4FRI analysis and nest roost recovery stands are located within FWPP. The FWPP incorporated these nest roost habitat delineations. Any impacts to MSO would be mitigated by coordinating with 4FRI to limit entries into PACs (see Design Features). Other ongoing implementation of fuels reduction projects such as Jack Smith Schultz, Eastside and Mormon Lake Basin are designed to minimize impacts to owls and mitigation of disturbance from implementation has been incorporated into the project design for all of these projects.

Decreases would occur in coarse woody debris, logs, and snags in the ponderosa pine for all of the above fuels reduction projects and would combine with FWPP to move away from desired conditions in the ponderosa pine. Burn prescriptions and ignition techniques should limit overall losses of logs and snags. Burned snags will fall and provide logs and trees killed by fire will become snags. The longevity of fire-killed snags is less than that of snags formed from other processes. However, maintenance burning should provide pulses of snags and logs through time. Less course woody debris is expected to be present as a result of prescribed burning. Thinning and burning should increase tree growth rates and self-pruning of the lower tree branches through time should gradually replenish course woody debris. Improving growing conditions should decrease density-related mortality of larger and older trees. Improving recruitment into the larger size classes will improve MSO habitat and the ability to provide large snags that remain on the landscape longer than smaller diameter or fire-created snags.

Cumulative effects from other proposed projects such as Mount Elden Dry Lake Hills Trails Planning, which overlaps with this project, would combine with effects from ground disturbance and noise disturbance to MSO and their habitat in the action area. The development of trails within protected and recovery habitat reduces the quality of that habitat however, design features would be implemented to mitigate impacts. MEDL also proposes to reduce disturbance from one trail by relocating it outside of the Mt. Elden nest core. Implementation of trails, trailheads, etc. would be coordinated around FWPP implementation. Continued use of

user-created trails in the Dry Lake Hills project may disturb roosting or nesting owls. New roads or trails would not be designated for public motorized or recreational use as part of the FWPP project, and all temporary roads would be obliterated after implementation.

There are additive effects of reduction of understory vegetation by livestock grazing in the Mormon Mountain project area. Livestock grazing would combine with short-term loss of understory vegetation from prescribed fire and logging operations. The Mormon Mountain project area is managed on deferred rotational and deferred rest rotation grazing systems designed to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative impacts. Prescribed burning would be coordinated with grazing schedules to minimize impacts to vegetation.

By managing for resistant and resilient ecosystems, promoting landscape connectivity, and implementing concepts of adaptive management, land and resource management can respond to new information and changing conditions related to climate change that have the potential to increase ecosystem risks. Risks associated with dense forest conditions would be reduced and forest resiliency large scale disturbance under drier and warmer conditions would be improved by implementing the treatments proposed under all action alternatives. Individual tree growth would improve, resulting in larger average tree sizes. Species requiring habitat elements associated with closed canopy forest conditions or old or large tree, snag, and log structure would be more sustainable as forest resiliency improved.

Determination of Effect

- Crown Fire Potential would be reduced in MSO habitats reducing the potential loss of habitat to wildfire.
- Trees would be thinned up to 5 inches dbh and dead and down material would be piled by hand and burned on approximately 122 acres within the Schultz nest core. Approximately 20 percent of the nest core would be deferred from treatment to maintain pockets of denser trees intended to provide more structural diversity for prey.There would be no cable corridors or temporary roads constructed in nest cores or recovery nest/roost habitat.
- There would be the complete loss of trees (including snags and large trees) on 74 acres in protected and 91 acres in recovery habitat due to cable corridors. This correlates to roughly 232 live trees and 741 snags >18" dbh that would be cut. Large logs would be increased on these acres.
- With the exception of snag retention patches, there would be an additional loss of snags on 391 acres in protected habitat and 423 acres in recovery habitat in areas cable logged. Large logs would be increased on these acres.
- Ground disturbance would impact 728 acres along with the construction of 11.7 miles of temporary roads and 1.8 miles road reconstruction in MSO habitat may have short term impacts to plant cover.
- There would be 3,926 acres of vegetation treatments in protected and 2,584 acres in recovery habitat that may have short term impacts but would have long term beneficial effects of improving habitat resilience and improving structure and function.
- There would be no thinning or burning or road construction/obliteration activities within nest cores during the breeding season. With the exception of hauling no PAC would be impacted by project activities for more than two years.
- Thinning activities would occur during the breeding season within some PACs being impacted for up to two years. Implementation would be designed to limit the number of breeding seasons that any one PAC would have thinning activities occurring during the

breeding season. Monitoring would be used to inform treatment schedules.

- Hauling would occur within a quarter-mile of Schultz, Archies, Weimer Springs, DeToros, Mormon Mountain, and Moore Well-Rock Dike nest cores. There would be an estimated 4,800 truckloads that would haul on these routes.
- Burning activities would be coordinated with the district biologist and would be designed to limit smoke during the breeding season. Pile burning would be completed in the winter and initial entry prescribed burning would be completed in the fall/winter within PACs.
- The MSO monitoring plan is designed to evaluate the effects of prescribed fire and hazardous fuels reduction treatments on spotted owl habitats, and to retain or move towards MSO desired conditions. This monitoring plan would provide valuable information on the effects of these activities on MSO and their habitat.

Based on the above analysis it is my determination that the project's activities may adversely affect the Mexican spotted owl and its critical habitat.

Alternative 3 – Proposed Action without Cable Logging

Refer to Table 9 for acres of thinning and burning proposed in MSO habitats. The acres of treatment are the same as Alternative 2, but with different harvest methods on steep slopes. Alternative 3 would use a combination of helicopter logging and specialized steep slope equipment to extract the timber rather than cable logging.

Direct and Indirect Effects

Effects from Thinning and Prescribed Burning

Under Alternative 3, treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. No cable logging would occur under this alternative, which would reduce the need to remove the large trees and logs on steep slopes and also the need to create corridors. Effects to MSO habitat are similar as those discussed under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however no trees greater than 18 inches dbh would be cut in PACs, and no trees greater than 24 inches dbh would be cut in recovery habitat. Helicopter logging allows for more flexibility for snag patch locations and the distribution of snags and large trees would be more consistently random due to the absence of proposed cable corridors. The Forest Plan amendment required for this alternative would not require an amendment to the Forest Plan to remove trees greater than 24 inches dbh in MSO recovery habitat.

Helicopter logging requires that all hazard trees are removed from the entire area that is helicopter logged to provide for safety of personnel on the ground outside of protected (closed-cab) machinery. Where helicopter logging would occur, patch cuts may be used in order to break up fuels to allow for the maintenance of snags outside of patches while also allowing for greater removal of trees (live and dead) and operational safety within the patches. Biologists would identify patches of snags up to 10 acres in size in advance of treatment layout. Not taking into account these patches, there would be approximately 267 acres in protected habitat and 425 acres of recovery habitat where all snags could be removed to provide for safety. This loss of snags would reduce these key habitat components in protected and recovery habitats. No helicopter logging would occur in the Mormon Mountain project area. Under Alternative 3, there would be fewer large trees and snags cut within PACs and wet mixed conifer in the Mormon Mountain area than Alternative 2. Overall, this alternative would result in less impact to MSO key habitat components including snags, logs and large trees.

Post Treatment Crown Fire Potential is the same as Alternative 2. Table 14 and 15 below summarize the post-treatment Crown Fire Potential for Dry Lake Hills and Mormon Mountain. Crown Fire Potential after implementation of Alternative 3 would greatly reduce the potential for active crown fire in each of the four PACs in the Dry Lake Hills and all of the recovery habitat in this area and at the same time shifting the majority of the habitat to crown fire potential of surface fire. The largest benefit in PACs would occur in the Schultz PAC where thinning is proposed within the nest core. For the Mormon Mountain project area crown fire potential after implementation of Alternative 3 would greatly reduce crown fire potential in each of the six PACs and all of the recovery habitat also shifting a majority of the acres to a surface fire rating.

Overall, this shift in fire type from active crown fire to surface fire will result in the majority of MSO habitat in a condition where low intensity, frequent fire would occur maintaining the historical, ecological role of fire.

Under Alternative3, the percentage of protected and recovery habitat with active crown fire potential is reduced mitigating the risk of large wildfires. The following tables reflect the change in crown fire potential within protected and recovery habitats.

Table 14: Alternative 3 Post Treatment Crown Fire Potential

Dry Lake Hills (Schultz Wildfire Weather Conditions) ALT3								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	**Total**
Recovery - Mixed Conifer		1539	86%	39	2%	194	11%	1793
Recovery - Nesting/Roosting		109	100%	0	0%	0	0%	109
Recovery - Pine Oak		275	99%	3	1%	0	0%	278
Protected - PAC	Mt Elden	450	72%	4	1%	174	28%	628
Protected - PAC	Orion Spring	311	95%	4	1%	12	4%	327
Protected - PAC	Schultz Creek	578	88%	1	0%	102	15%	660
Protected - PAC	Weatherford2	130	81%	8	5%	23	14%	161

Table 15: Alternative 3 Post Treatment Crown Fire Potential

Mormon Mountain (Schultz Wildfire Weather Conditions) ALT3								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	Total
Recovery		623	82%	136	18%	1	0%	761
Recovery Nest/Roost		22	99%	0	1%	0	0%	22

Protected - PAC	Weimer Springs	559	96%	14	2%	7	1%	580
Protected - PAC	Mormon Mountain North	512	84%	93	15%	5	1%	610
Protected - PAC	Mormon Mountain	137	93%	10	7%	0	0%	147
Protected - PAC	Moore Well/Rock Dike	16	77%	5	23%	0	0%	21
Protected - PAC	Lockwood	150	100%	0	0%	0	0%	150
Protected - PAC	De Toros	573	87%	69	11%	14	2%	657

Effects of Ground Disturbance

Project activities that may cause ground disturbance include; logging and skidding operations, temporary and relocated roads, helicopter and log landings. Effects to MSO habitat are similar as Alternative 2; however some landings would be replaced by helilandings and no cable logging would occur under this alternative, which would reduce the need to create corridors. Table 16 summarizes the miles of temporary roads and road reconstructions in MSO habitats.

Table 16: Alternative 3 - Miles of Temp and Relocated Roads in Protected (by PAC) and Recovery Habitats

	Miles of Temp Roads/Reconstructions
DeToros PAC	.4/.1
Lockwood PAC	.2/0
Moore Well PAC	0/0
Mormon Mountain PAC	.5/0
Mormon Mountain North PAC	.5/.4
Weimer Springs PAC	0/0
Schultz Creek PAC	1.2/0
Mount Elden PAC	.2/0
Orion Spring PAC	.1/0
Weatherford2 PAC	0/0
Total Miles in PACs	**3.1/.5**
Recovery Habitat	DLH – 3.5/.9 MM - .9/0
Recovery Nest/Roost	DLH – 0 MM - 0
Total Miles in Recovery	**4.4/0.9**
TOTAL	**7.5/1.4 miles**

No temporary roads would be constructed in MSO nest cores, reducing the potential for adverse effects to nesting owls. Temporary roads, landings and skid trails would be needed in PACs and recovery habitats in order to accomplish thinning treatments; however all would be rehabilitated after harvesting. This alternative would have 3.1 miles of temporary roads in protected habitat and 4.4 miles in recovery habitat. The construction of temporary roads would remove important habitat components such as large trees, snags, and downed wood on approximately 5.3 acres (assuming a 14-foot wide road) in protected habitat, and 7.5 acres in recovery habitat. Road reconstruction

would be needed in order to accomplish thinning treatments with 0.5 mile in protected habitat and 0.9 mile in recovery habitat, affecting approximately 0.9 and 1.6 acres, respectively.

Although ground disturbance associated with landings and ground based harvest activities would be less than Alternative 2 due to the lack of corridors, it would be more than Alternative 4 because more acres within MSO habitats would be treated.

Effects from Noise Disturbance from Project Implementation

Disturbance would be similar to Alternative 2; however there would be additional disturbance from helicopter operations. Prior to implementation, an implementation guide would be developed to insure helicopter landings and flight patterns are located in areas away from nesting owls.

The use of helicopter logging would require landings where trees are processed at the landing area with a processor. Delaney (1999) indicates 105-m (344 ft) buffer zone for helicopter overflights would minimize impacts of helicopter overflights on Mexican spotted owls. PACs in the Mormon Mountain area would not be impacted as no helicopter logging would occur in that project area; however, all PACs in the Dry Lake Hills area could be impacted. Implementation of all proposed helicopter logging treatments within MSO habitats (protected and recovery) in the Dry Lake Hills would likely exceed 140 days in duration. However, a design feature to limit thinning and logging in each PAC to no more than two breeding seasons would limit the duration any one PAC would be impacted. An implementation plan would be designed to ensure helicopter operations (i.e. helilanding locations, flight patterns) would minimize impacts to nesting owls (see Design Features).

Cumulative Effects

Cumulative effects are the same in nature as that of Alternative 2, but would be slightly less since no trees greater than 18 inches dbh would be cut in PACs, and no trees greater than 24 inches dbh would be cut in recovery habitat. This is not expected to change the cumulative effects from that analyzed for Alternative 2 because even given the removal of large trees in Alternative 2, there would still be ample large trees to meet desired conditions when averaged across the project area.

Determination of Effect

- Crown Fire Potential would be reduced in MSO habitats reducing the potential loss of habitat to wildfire.
- Trees would be thinned up to 5 inches dbh and dead and down material would be piled by hand and burned on approximately 122 acres within the Schultz nest core. Approximately 20 percent of the nest core would be deferred from treatment to maintain pockets of denser trees intended to provide more structural diversity for prey.There would be no helicopter logging or temporary roads construction in nest cores or recovery nest/roost habitat.
- With the exception of hauling there would be no thinning, burning or road construction/obliteration in nest cores during the breeding season.
- With the exception of snag retention patches, there would be a loss of snags on 267 acres in protected and 425 acres recovery habitat in areas where helicopter logging is the harvest method. There would been an increase in large logs on these acres.
- Ground disturbance would impact 728 acres along with the construction of 7.5 miles of temporary roads and 1.4 miles road reconstruction in MSO habitat may have short term impacts to plant cover.
- There would be 3,954 acres of vegetation treatments in protected and 2,584 acres in recovery habitat that may have short term impacts but would have long term benefits by improving habitat resilience and improving structure and function.
- Thinning activities would occur during the breeding season in the project area.

Implementation would be designed to limit the number of breeding seasons so that any individual PAC would not have thinning activities occurring during the breeding season for more than two breeding season. Monitoring would be used to inform treatment schedules.

- Hauling would occur within a quarter-mile of Schultz, Archies, Weimer Springs, Detoros, Mormon Mountain, and Moore Well-Rock Dike nest cores. There would be an estimated 4,700 truckloads that would haul on these routes.
- Burning activities would be coordinated with the district biologist and would be designed to limit smoke during the breeding season. Pile burning would be completed in the winter and initial prescribed burning would be completed in the fall/winter within PACs.
- Other activities, such as thinning, burning and temporary roads may have short term impacts but would have long term benefits by improving habitat resilience and structure and function.
- The MSO monitoring plan is designed to evaluate the effects of prescribed fire and hazardous fuels reduction treatments on spotted owl habitats, and to measure retention or movement towards MSO desired conditions. This monitoring plan would provide valuable information on the effects of these activities on MSO and their habitat.

Based on the above analysis it is my determination that the project's activities may adversely affect the Mexican spotted owl and its critical habitat.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects

Proposed Treatments in MSO Habitat

Alternative 4 proposes the minimal amount of treatment necessary to meet the purpose and need. Treatments are proposed for those areas with dense fuel loading where topography aligns with dominant winds and the probability of severe effects to soil resources from a wildfire is greater, based on FLAMMAP modeling. Table 17 summarizes the acres of treatments proposed in MSO habitats.

Table 17: Alternative 4 - Acres of Treatments in MSO Habitat

	Protected Habitat	Recovery Habitat
Mixed Conifer Fuels Reduction	0	542
Ponderosa Pine Fuels Reduction – Hand thinning	0	86
Ponderosa Pine Fuels Reduction	0	277
MSO PAC Fuels Reduction (wet mixed conifer)	0	0
MSO PAC Fuels Reduction	2077	0
MSO PAC Fuels Reduction- Hand Thinning	228	0

MSO Nest Fuels Reduction – Burn Only	0	0
MSO Nest Fuels Reduction – Hand Thinning	122	0
MSO Recovery Nest/Roost	0	22
Totals	2427	927

Effects from Thinning and Prescribed Burning

This alternative would have the least amount of thinning and prescribed burning in MSO habitats of all the alternatives. For the Mormon Mountain area, not treating the wet mixed conifer would result in less opportunity for creating openings within aspen stands to promote aspen regeneration within protected habitat in the Mormon Mountain area. Heavy fuel loading would continue to be present in many portions of the project area as dead and down material would remain on site, thereby increasing the chance for more severe wildlife effects if one were to occur. This would also not encourage stand heterogeneity in many areas of the project area resulting in less diversity of prey habitat.

The Spruce Avenue Wash was identified as a high priority area due to the fuel loading, topography, size and also its location relative to the City of Flagstaff and MSO PACs. The portion of the Elden MSO PAC within the Spruce Avenue Wash would also be treated under the same parameters described in Alternatives 2 and 3.The Schultz MSO PAC and nest core were identified in conjunction with the U.S. Fish and Wildlife Service (FWS) as high priority areas, and would also receive the same treatment described for Alternatives 2 and 3. No treatment in other nest cores would occur under this alternative. Treatments in both the Schultz and Elden PACs and the Schultz nest core would reduce the crown fire potential in those PACs (Tables 18 and 19).

There would be no cable corridors or areas harvested by cable or helicopter logging within protected or recovery habitat, and temporary roads would be reduced slightly within these habitats (3.1 miles in protected habitat and 4.4 miles in restricted; see Table 20). This alternative would not require the Forest Plan amendment to include cutting trees greater than 24 inches dbh in recovery habitat. This alternative would have fewer snags and large trees removed from MSO habitats than Alternative 2 and 3, but would have more removed than Alternative 1.

Table 18 and 19 below summarize the post-treatment Crown Fire Potential for Dry Lake Hills and Mormon Mountain. Under Alternative 4, Crown Fire Potential 20 years after implementation would be greatly reduced in three of the four PACs in the DLH and in recovery habitat at the same time shifting the majority of the habitat to crown fire potential of surface fire. The largest benefit in PACs would occur in the Schultz PAC where thinning is proposed within 80% of the nest core. Acres of treatment are less than the other action alternatives, Alternative 4 shows fewer acres shifting from crown to surface fire in the four Dry Lake Hills PACs. Crown fire potential increases in the recovery nest/roost habitat and in the Orion Springs PAC. This means that even though these stands are receiving treatment, it is not intense enough to show an improvement in crown fire potential and will actually increase under Alternative 4 (Wes Hall, personal communication, 1/21/2014). For the Mormon Mountain project area crown fire potential after implementation of Alternative 4 would greatly reduce active crown fire potential in each of the six PACs and all of the recovery habitat would also shift a majority of the acres to a surface rating.

Overall, this shift in fire type from active to surface will result in the majority of MSO habitat in a condition where low intensity, frequent fire would occur maintaining the historical, ecological role of fire.

Table 18: Alternative 4 Post Treatment Crown Fire Potential

Dry Lake Hills (Schultz Wildfire Weather Conditions)								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	**Total**
Recovery Mixed Conifer		824	46%	195	11%	740	41%	1794
Recovery - Nesting/Roosting		32	29%	15	14%	59	55%	109
Recovery Pine Oak		202	73%	8	3%	67	24%	278
Protected PAC	Mt Elden	248	40%	26	4%	353	56%	628
Protected PAC	Orion Spring	105	32%	9	3%	214	65%	329
Protected PAC	Schultz Creek	650	99%	1	0%	8	1%	660
Protected PAC	Weatherford2	70	43%	0	0%	88	55%	161

Table 19: Alternative 4 Active crown fire potential in MSO habitats for Mormon Mountain project area

Mormon Mountain (Schultz Wildfire Weather Conditions)								
MSO	**PAC Name**	**Surface**	**%**	**Passive**	**%**	**Active**	**%**	Total
Recovery		758	99%	0	0%	4	0%	764
Recovery Nest/Roost		21	100%	0	0%	0	0%	22
Protected PAC	Weimer Springs	496		24	4%	63	11%	582
Protected PAC	Mormon Mountain North	452	85%	55	9%	105	17%	610
Protected PAC	Mormon Mountain	63	74%	43	29%	42	28%	148
Protected PAC	Moore Well Rock Dike	14	42%	2	11%	6	26%	21
Protected PAC	Lockwood	139	63%	2	1%	9	6%	149
Protected PAC	De Toros	216	33%	113	17%	328	50%	660

With fewer acres of treatment, thinning treatments could be accomplished in a shorter time frame, reducing the duration of noise disturbance during the MSO nesting season.

Ground Disturbance

Ground disturbance would be primarily from operation of equipment, landings and temporary roads. Of the 2,918 acres of ground based harvest method in MSO habitat, approximately 2,077 acres are protected habitat and 841 acres are recovery habitat. Roughly 408 acres (14 percent) could be impacted by compaction, rutting, and/or exposure of bare mineral soil. Table 20 summarizes the acres of temporary roads required within MSO habitats for Alternative 4.

Table 20: Alt 4 - Number/Acres of Temp and Relocated Roads in Protected (by PAC) and Recovery Habitat

	PAC Name	Miles of Temp Roads/ Relocated Roads
Protected	DeToros	.5/.1
	Lockwood	.2/0
	Moore Well –Rock Dike	0/0
	Mormon Mountain	.5/0
	Mormon Mountain North	.5/.4
	Weimer Springs	0/0
	Schultz Creek	1.2/.1
	Mount Elden	.2/0
	Orion Spring	0/0
	Weatherford2	0/0
Total Protected		3.1/.6
Recovery	Recovery Habitat Type	
	Recovery Habitat	DLH - 3.5/.9 MM - .9/0
	Recovery Nest/Roost	DLH - 0/0 MM – 0/0
	Total	4.4/0.9

No temporary roads would be constructed in MSO nest cores, reducing the potential for adverse effects to nesting owls. Temporary roads, landings and skid trails would be needed in PACs and recovery habitats in order to accomplish thinning treatments; however all would be rehabilitated after harvesting. This alternative would have 3.1 miles of temporary roads in protected habitat and 4.4 miles in recovery habitat. The construction of temporary roads would remove important habitat components such as large trees, snags, and downed wood on approximately 5.3 acres (assuming a 14-foot wide road) in protected habitat, and 7.5 acres in recovery habitat . Road reconstruction would be needed in order to accomplish thinning treatments with 0.6 mile in protected habitat and 0.9 mile in recovery habitat, affecting approximately 1.0 and 1.6 acres, respectively.

Effects from Disturbance from Project Implementation

This alternative would have the least amount of total disturbance from project implementation. There would be no disturbance from helicopter operations or cable logging corridors. Although the same haul routes would be used, there would not be as many vehicle trips required and the duration of the project would be shorter than the other action alternatives: approximately 6,800 total vehicle trips in the Dry Lake Hills and 4,700 in Mormon Mountain compared to 9,000 in Dry Lake Hills and 4,800 and 4,700 in Mormon Mountain for Alternatives 2 and 3, respectively.

Cumulative Effects

Cumulative effects are similar to alternatives 2 and 3, but would be slightly less since no trees greater than 18 inches dbh would be cut in PACs, and no trees greater than 24 inches dbh would be cut in recovery habitat. This is not expected to change the cumulative effects conclusions from that analyzed for Alternative 2 because even given the removal of large trees in Alternative 2, there would still be ample large trees to meet desired conditions when averaged across the project area.

This alternative would remove many fewer snags compared to alternatives 2 and 3 and thus would not have similar cumulative effects from snag removal. This alternative would include removal of snags on up to 16 acres where there is temporary road construction or road reconstruction. This could combine cumulatively with impacts to snags from adjacent treatments that result from the 4FRI project, which is also likely to remove a small number of snags for temporary road construction. This cumulative effect is of most importance in the MM treatment area where there is more overlap with 4FRI treatments and snag numbers are currently not meeting desired conditions in protected or recovery habitat.

Determination of Effect

- Crown Fire Potential would be reduced in MSO habitats reducing the potential loss of habitat to wildfire.
- Trees would be thinned up to 5 inches dbh and dead and down material would be piled by hand and burned on approximately 122 acres within the Schultz nest core. Approximately 20 percent of the nest core would be deferred from treatment to maintain pockets of denser trees intended to provide more structural diversity for prey.
- There would be no cable corridors, helicopter logging operations, or temporary roads construction in nest cores or recovery nest/roost habitat.
- There would be no thinning, burning road construction or obliteration activities within nest cores during the breeding season, and with the exception of hauling, no individual PAC would be impacted for more than two years.
- Hauling would occur within a quarter-mile of Schultz, Archies, Weimer Springs, DeToros, Mormon Mountain, and Moore Well-Rock Dike nest cores. There would be an approximate 4,700 truckloads that would haul on these routes.
- There would be no significant loss of snags, large trees or other key habitat components in MSO habitats.
- Ground disturbance would impact 408 acres along with the construction of 7.5 miles of temporary roads and 1.5 miles of road reconstruction in MSO habitat may have short term impacts to plant cover.
- There would be 2,427 acres of vegetation treatments in protected and 927 acres in recovery habitat that may have short term impacts but would have long term benefits by improving habitat resilience and improving structure and function.
- Burning activities would be coordinated with the district biologist and would be designed to limit smoke during the breeding season. Pile burning would be completed in the winter and prescribed burning would be completed in the fall/winter within PACs.
- Other activities, such as thinning, burning and temporary roads may have short term impacts but would have long term benefits by improving habitat resilience and structure and function.
- The MSO monitoring plan is designed to evaluate the effects of prescribed fire and hazardous fuels reduction treatments on spotted owl habitats, and to retain or move towards MSO desired conditions. This monitoring plan would provide valuable information on the effects of these activities on MSO and their habitat.

Based on the above analysis it is my determination that the project's activities may adversely affect the Mexican spotted owl and its habitat. The project activities may affect, but are not likely to adversely affect MSO critical habitat.

Forest Service Sensitive Species

Bald Eagle

Analysis Methods

The following evaluation criteria were used to compare environmental consequences for alternatives:

- Removal of potential habitat
- Disturbance from project implementation

Existing Conditions

The bald eagle was removed from the list of threatened and endangered species August 8, 2007 (USDI 2007). Eagles are currently protected under the Golden and Bald Eagle Protection Act and bald eagles are a Forest Service Sensitive species.

The Dry Lake Hills project area does not have occupied or potential nesting or roosting habitat. Though the Mormon Mountain project area does not contain any known bald eagle nests or winter roosts, it is within one mile of Mormon Lake and as such provides potential nesting and roosting habitat. The nearest documented winter roost is located approximately two miles southeast of the project boundary at Mormon Lake. Groups of old growth ponderosa pine that are dominated by large, tall trees with open canopies occur throughout the Mormon Mountain project area. Roosts on the Coconino National Forest are often associated with water bodies large enough to support reliable populations of fish and waterfowl (Dargan 1991). Although the project area does not contain any such water bodies, bald eagles may still establish roosts in the area, given the presence of suitable tree stands and the proximity of Mormon Lake as a reliable prey source. Recruitment of future suitable winter roost habitat has been reduced by wildfire suppression, facilitating the expansion of dense stands of small trees and preventing the development of large diameter trees and snags.

As mentioned above, there are no known nesting bald eagles within the project area. The closest known breeding bald eagles use three nests along Lower Lake Mary that are located approximately 4, 5 and 7 miles north of the Mormon Mountain project area, respectively. In Arizona, bald eagles typically nest within one mile of a major river or water body, and most breeding areas contain riparian vegetation (Driscoll et al. 2006). These components are not present within one mile of the Dry Lake Hills and it is unlikely that that project area would provide nest sites for bald eagles in the future.

Bald eagles are primarily winter visitors to the Coconino National Forest, occupying all habitat types and elevations. Wintering eagles arrive in the fall, usually late October or early November, and leave in early to mid-April. They feed on fish, waterfowl, terrestrial vertebrates, and carrion. Eagles are often seen perched in trees or snags near water or next to roadways where they feed on road-killed animals. On the Forest, small to moderate sized groups (usually 2-48) of bald eagles roost at night in clumps of large trees in protected locations such as drainages and hillsides (Grubb and Kennedy 1982, Dargan 1991). Eagles typically roost in ponderosa pine stands that are variable in size (less than an acre to 43 acres), are often on north or northeast-facing slopes, and are close to daytime foraging areas (Dargan 1991). Roost trees are large live or dead ponderosa pine trees averaging 28 inches dbh that occur in groups and are much larger than other trees in roost stands (Dargan 1991).

Alternative 1 – No Action Alternative

Direct and Indirect Effects
Habitat conditions would remain in their current condition, notwithstanding natural processes. Because there would be no habitat altering activities or disturbance associated with project implementation, this alternative would have no direct effect on the bald eagle. However, dense forest conditions would still occur and the high fire hazard potential would continue to place potential bald eagle roosting and foraging habitat at risk with respect to stand-replacing fire, resulting in indirect adverse effects.

Tree densities would continue to be high, slowing their growth into larger diameter classes and thereby limiting the development of larger diameter (greater than 18 inch dbh) trees important for roosting and perching. This would have an indirect adverse effect on bald eagle habitat.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to bald eagle habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place bald eagle habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. Forests would continue to be susceptible to the effects of climate change including vulnerability to insects, disease, and high severity fire, thus continuing to have a negative effect to potential bald eagle habitat.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Direct effects would be from activities that cause disturbances (smoke, auditory or visual) to bald eagles within or adjacent to the project. Under Alternative 2, there would be no direct effects to nesting or roosting eagles as the nearest breeding area is four miles from the project and the nearest roost is two miles away, and noise generated from these activities is not expected to be audible at the nearest nest or roost sites. Smoke from burning in the Mormon Mountain project area is expected to settle within the low lying areas of the Lake Mary Watershed and could adversely affect nesting eagles. Spring or summer burning in the Mormon Mountain project area would be coordinated with the District Biologist and Fish and Wildlife Service personnel if any of the three eagle nests are occupied. Typically nesting can be confirmed by May.

Skyline logging uses a system of cables to drag logs of whole trees from the cutting unit to a roadside landing. It is used on sites that are too steep for ground based operations. Roughly parallel "corridors" for the skyline needs to be placed every 100 to 140 feet. These corridors are approximately 12-feet wide and must have all trees removed from them to facilitate yarding. Much of this area contains large (greater than 24 inches dbh) pre-settlement trees and snags. Roughly 45 acres of potential nesting/roosting would be denuded by cable corridors (Appendix C, Table 37). This loss of large trees would be compensated as treatments are designed to grow trees into the larger size classes over time.

In addition, cable logging requires that all hazard trees are removed from the entire area that is cable logged to provide for safety of personnel on the ground outside of protected machinery. A design feature requires biologists to identify patches of snags up to 10 acres in size to allow for retention of some snags in these areas. Not taking into account these patches, there would be approximately 61 acres in potential bald eagle nesting/roosting habitat where all snags could be removed to provide for safety (Appendix C, Table 37).

Under Alternative 2, mechanical treatments, broadcast and pile burning and hauling of timber may cause visual or auditory disturbance to foraging bald eagles. This disturbance would be localized, of short duration and low intensity and may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Indirect effects to the bald eagle include effects to eagle habitat, eagle prey species, or prey species habitat. There are no anticipated adverse effects to prey species or prey species habitat. Indirect effects to habitat would occur from treatments that modify the number of trees in a group of suitable roost trees, as eagles prefer to roost in large trees within close proximity to other large trees. However, thinning would improve old tree longevity, resulting in beneficial effects. Design features to protect snags would reduce the number of snags and logs burned through a combination of burning techniques and lining (see Design Features). Recruitment snags would be identified from live trees that exhibit defects ideal for wildlife. For example, trees with spiked tops, lightning strikes, mistletoe brooms, or fading crowns. In addition, Alternative 2 would include developing old-growth stands in 74% of the Mormon Mountain project area that may be used as future winter roost sites for bald eagles.

Cumulative Effects

The cumulative effects boundary is the action area, defined as the project area and a one-half mile buffer. I considered effects for a period of 20 years beginning with implementation of the project. There is no effect to nesting eagles as there are no nesting eagles present within the project area; however, there may be possible short-term disturbance to potential roosting habitat with long term benefits. Short term disturbance to foraging bald eagles would occur during thinning and broadcast burning activities and may cause eagles to forage in nearby areas for the duration of the activity. These short-term impacts added to similar impacts from past, present, and reasonable foreseeable projects (including 4FRI and Mormon Lake Basin Fuels Reduction Projects) were considered. Implementation of other fuels reduction project activities could occur simultaneously; however, it is not anticipated to combine to cause a negative effect. Vegetation treatments in adjacent projects would also improve tree vigor and growth, and vegetative structural stage diversity, thus promoting the growth of larger trees and habitat components for eagles as well as the forest's resiliency to climate change. Other cumulative effects include hazard tree removal for powerlines, communication sites and highways, which have reduced the number of snags and large trees for perching along potential winter foraging areas in the project area; however it is not anticipated to combine to cause a negative effect.

Determination of Effect

The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects

Effects to bald eagle habitat are similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistently random due to the absence of proposed cable corridors and areas where snags would be removed for safety purposes. Treatments would utilize ground-based harvesting across the majority of the project area, and helicopter would not be used in the Mormon Mountain area where bald eagles are known to occur. This would reduce the number of large trees and snags cut within potential bald eagle nesting/roosting habitat in the Mormon Mountain area.

Since no helicopters would be used to harvest trees in the Mormon Mountain project area, there would be no potential for noise disturbance from helicopters to bald eagles. Fuels reduction treatments may cause visual or auditory disturbance to foraging eagles.

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Determination of Effect
The project's activities may impact individuals but are not likely to cause a trend toward listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to bald eagle habitat are similar to alternative 3 as there would be no cable corridors or areas harvested by cable or helicopter logging required to accomplish thinning treatments reducing the need to remove potential perch or roost trees.

There would be 630 fewer acres of thinning and burning treatments in Mormon Mountain, where bald eagle habitat occurs, reducing the development of larger size classes to only those areas to be treated.

Cumulative Effects
Cumulative effects are the same as the other action alternatives, but to a slightly lesser extent as fewer acres would be treated.

Determination of Effect
The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Northern Goshawk

Analysis Methods
The following evaluation criteria were used to compare environmental consequences for all alternatives:

- VSS distribution and canopy over within post-fledgling family area (PFA) and areas outside PFAs
- Canopy cover within post-fledgling family area, nest stands and foraging area
- Disturbance from project implementation. Short-term would be generally one year post treatment depending upon climate and moisture. Long-term would be a period of twenty years and would include implementation of all vegetation treatments including initial and maintenance burning.

Existing Conditions
The northern goshawk occupies ponderosa pine, mixed conifer, and spruce-fir forest types in the Southwest. The goshawk is a forest habitat generalist that uses a wide variety of forest stages. It prefers stands of intermediate canopy cover for nesting, while more open areas are used for foraging. All forested (ponderosa pine, mixed conifer and spruce-fir) habitat above the Mogollon Rim is considered to be goshawk habitat, including any associated pine or mixed conifer stringers that may extend below the rim. The goshawk preys on large to medium sized birds and mammals it captures on the ground.

Reynolds et al. (1992) provided specific habitat management guidelines designed to increase productivity of northern goshawks in the southwestern United States. The COF adopted these guidelines in a resource plan amendment in 1996 for areas outside of threatened species habitats. There are approximately 1,739 acres of Landscapes Outside of PFAs (LOPFA) and 224[2] acres in PFAs that would be managed under these guidelines. The existing and desired conditions are based on the guidelines provided in Reynolds et al. (1992).

Northern goshawk habitat exists within and adjacent to the project area. All potential nesting and foraging habitat not overlapping with MSO PACs in the project area and a half-mile buffer was surveyed for northern goshawks in 2012 and 2013 according to Region 3 protocol. East-west transects were established, with survey points mapped every 260 meters (853 feet). Transects were 302 meters apart (989 feet), and points along each transect were offset from those along the adjacent transect(s), such that they occurred at the midpoint between survey points along the adjacent transect(s). A total of 824 call points were surveyed.

Three post-fledging family areas (PFAs) intersect the project area: Schultz, Orion and Thicket. Existing nest stands and alternate nest stands totaling 180 acres or more have been delineated for each of the three existing PFAs. All three PFAs were surveyed in 2013 with no detections. Table 21 summarizes the acres of PFAs and nest stands and Figure 3 (Dry Lake Hills) and Figure 4 (Mormon Mountain) display these habitats within the project area.

Table 21 NOGO PFA and Nest Stand Acres in the Project

PFAs Name	Total PFA Acres	PFA Acres within Project	Total Nest Stand Acres	Nest Stand Acres within Project
Thicket (#03040500)	650	423	181	50
Orion (#030402025)	777	391	190	21
Schultz Pass (#030402006)	612	393	183	100
Total	2039	1207	554	171

Other PFAs not listed above that are within the Action Area (project area plus a ½ mile buffer) include Bear (#030405012).

Wildfire suppression has led to accumulations of dense, small-diameter, young ponderosa pine trees within and adjacent to the PFAs that pose an increased risk of catastrophic fire in northern goshawk habitat. These conditions also promote risk of disease, inhibit recruitment of important habitat features such as old-growth trees and snags, and restrict the conditions necessary to support a variety of prey species for northern goshawks.

Existing Vegetative Structural Stages (VSS) distribution within the PFA, including the alternate nest area, is predominately VSS 3 and 4. Outside the PFA the existing Vegetative Structural Stages (VSS) distributions include VSS 3, VSS 4 and VSS 6 classes with VSS 3 and VSS 4 predominate.

[2] Includes northern goshawk nests (46 acres)

Figure 3 Dry Lake Hills NOGO PFAs

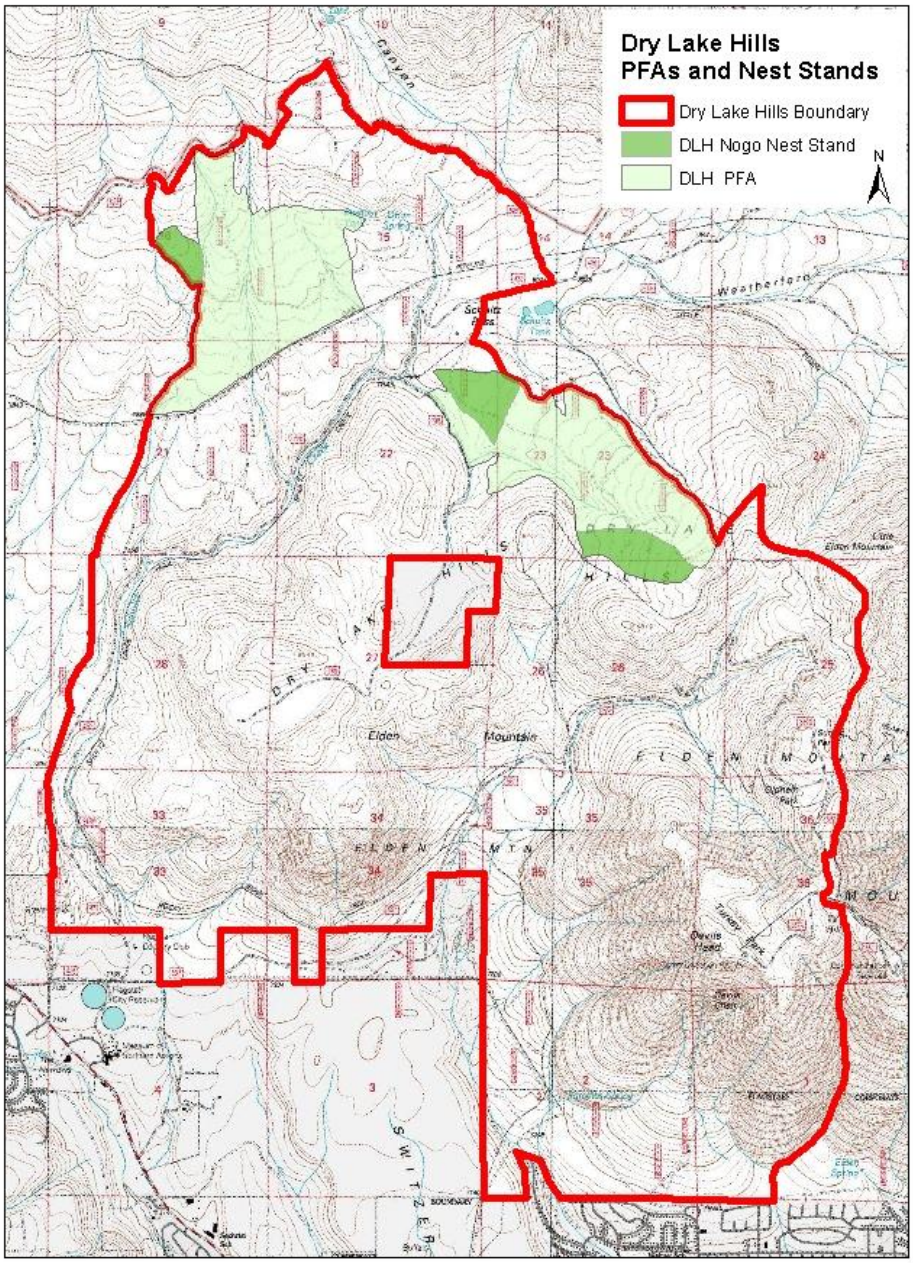
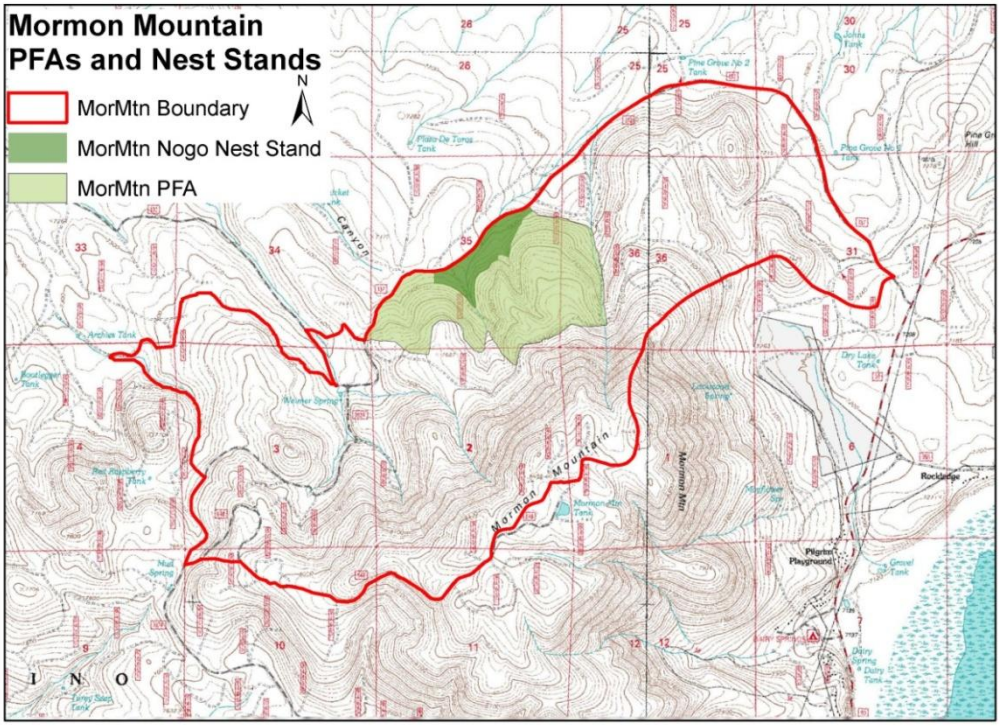


Figure 4 Mormon Mountain NOGO PFAs



Alternative 1 – No Action Alternative

Direct and Indirect Effects

Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect on goshawks. However, dense forest conditions would still occur and the high fire hazard potential would continue to place goshawk habitat at risk with respect to stand replacing fire. Vegetative structural stage distributions as outlined in the Forest Plan and Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds 1992) would never be attained.

Cumulative Effects

The cumulative effects boundary is the action area, defined as the project area and a one-half mile buffer. I considered effects for a period of 10 years beginning with implementation of the project. The No Action Alternative would maintain the current fire risk to northern goshawk habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place goshawk habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow, fuel continue to accumulate, and the impacts of climate change continue, thus continuing to have negative effects to northern goshawk.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Effects from Thinning and Prescribed Burning

Under Alternative 2, all treatments in goshawk habitats are designed to move toward the desired conditions as identified in the Northern Goshawk Management Guidelines (Reynolds et. al) and described in Appendix A, Table 1. Treatments are designed to maintain large snags, large logs and develop trees into the larger size classes. Typically snags would not be targeted for removal.

Under Alternative 2, approximately 178 acres would be treated within the Orion and Schultz PFAs with a prescription specifically designed to meet goshawk guidelines for PFAs, and 46 acres would be treated with a prescription specifically designed to meet the guidelines for nest stands. For LOPFAs, the alternative proposes 1,739 acres of ponderosa pine fuel reduction with 136 acres of hand thinning proposed. In areas where MSO habitat overlaps with goshawk habitat, MSO guidelines and desired conditions would take precedence. MSO treatments would move toward an uneven-aged condition; however they would likely exceed canopy cover standards so these acres would not move toward the desired structural stage distribution identified in the goshawk guidelines.

Treatments would alter VSS class distribution, changing the project area from one dominated by VSS 3 more toward the desired future condition, although still not meeting the desired future condition. Although the desired future condition would not be met immediately after implementation, the forest structure would be such that it would be moving towards it (Silviculture Specialist Report). Alternative 2 would offer higher quality foraging habitat over time due to improved habitat conditions for prey species.

Under Alternative 2, snags and large trees would be cut for cable corridors within the Orion PFA. All snags within the 60 acres proposed for harvesting by cable logging within the Orion PFA could be cut for safety reasons. There would be a loss of snags and downed logs during broadcast burning, although many would be protected using appropriate ignition and piling techniques, and lining of most snags and large logs (see Design Features). In addition, after burning, trees would be felled to replace logs burned up during prescribed fire to meet forest plan guidelines. Recruitment snags would be identified from live trees that exhibit defects ideal for wildlife. For example, trees with spiked tops, lightning strikes, mistletoe brooms, or fading crowns.

Reduction of snags and logs would have a negative impact on numbers of prey items, thus prey availability, for northern goshawk. The impact of this effect is expected to lessen in the long-term as snags are cut or fall and become logs; however the number of snags would continue to be in short supply due to an existing shortage of snags in some stands. The number of snags is expected to increase in the future as other trees grow, age, and die. Under this alternative, the resiliency of the area to withstand wildfire would improve due to the increase of crown base height and the reduced ground fuels. This alternative would have the most impact to dead and down woody material, gambel oak and snags.

There are potential direct effects from smoke. Smoke could affect nesting and feeding behavior. Avoiding burning near goshawk nesting areas during critical periods in the goshawks life cycle is important. Smoke accumulation during times when goshawks are incubating eggs and

tending nestlings and fledglings could cause adults to leave the area; this in turn could cause reproductive failure for the year. Goshawk may be flushed from nest sites and/or change their foraging behavior due to smoke accumulation. This could cause goshawks to expend more energy and/or cause them to be detectable to predators during movements. Smoke from broadcast burning may disturb individual birds, although this would be a short-term effect (1-3 days) and of low intensity (drift smoke). Activities would be temporally and spatially separated, which would reduce overall effect and thus not affect the overall distribution of northern goshawk. Impacts from smoke would also be reduced by the coordination of timing and type of burning with wind direction, topography, time of year and distance to the goshawk nesting area.

Effects from Ground Disturbance

In addition to thinning and burning cable corridors and temporary road construction would be required to implement this alternative. Table 22 summarizes the acres of cable corridors, temporary roads and road reconstructions that are proposed in northern goshawk habitats.

Table 22: Alt. 2 - Cable Corridors (Acres) and Temporary Roads (Miles) in NOGO Habitat

PFA Name	Acres with Skyline/ Excaline Harvest Method in PFA	Acres with Skyline/Excaline Method in Nest Areas	Acres of Cable Corridor in PFA	Miles of Temp Road/Road Reconstruction in PFA	Miles of Temp Road/Road Reconstruction in Nest Areas
DLH	60	0	8	1.4/.9	.4/.5
Mormon Mtn.	0	0	0	.3/.3	.18/0
Total in PFAs	**60**	**0**	**8**	**1.7/1.2**	**.5/.5**
Outside of PFAs	DLH – 182* MM- 0	N/A	39*	DLH - 15.6/.23 MM – 3.51/.24	N/A

*Acres outside of MSO habitat.

Prescribed burning, thinning, temporary road construction and rehabilitation and corridor construction may indirectly affect the goshawk by changing the goshawks habitat structure (snags, downed logs, woody debris, vegetative structural stages, and dense canopy cover). In addition, the proposed activities may change the structure of goshawk prey species' habitat, affecting the abundance and composition of prey species. Although treatments, especially prescribed burning, may have adverse effects to prey species and their habitat in the short-term (generally one year, depending on climate and moisture), the proposed treatments may increase diversity of vegetative conditions, which would provide for a diverse prey base. Overall this would have an indirect beneficial impact on goshawks.

Effects from Noise Disturbance

Disturbance to raptors and in many instances can cause nest abandonment or changes in home range (Anderson et. al. 1990). Monitoring of motorized use on northern goshawk, however, has showed very little effect on individual goshawks, causing biologists to consider motor vehicle use a "minor stressor" (Slausen and Zielinski 2008). A noise study on goshawks conducted by Grubb et. al. (1998) found that logging trucks did not elicit a discernible response when they passed within 0.3 mile (500 meters) of active nests. However, in an experimental study on the Kaibab NF, Grubb et al. (2012) found no evidence that the awareness of noise generated from logging trucks was correlated with actual negative effects to nesting northern goshawks. The observed response from nesting goshawks was limited to, at most, looking in the direction of the hauling road (Grubb

et al. 2012). Noise disturbance could be caused by project implementation activities including thinning and burning, road construction and maintenance, hauling of logs to areas outside of the project, and road rehabilitation. Noise from mechanical treatments are not likely to directly affect nesting goshawks as no thinning would occur within nest stands during the breeding season. Implementation would be designed to limit disturbance in each PFA to two breeding seasons to reduce the duration of disturbance.

Cumulative Effects

The cumulative effects boundary is the action area, defined as the project area and a one-half mile buffer. I considered effects for a period of 20 years beginning with implementation of the project and includes past and reasonably-foreseeable fuels reduction/forest health projects, recreation, lands projects, grazing, and climate change. There are additional indirect effects from vegetation modification activities occurring in other projects, including hazard tree removal for powerlines and highways, as well as tree removal for development of state and private lands. Grazing can temporarily reduce vegetative cover. The Dry Lake Hills project area is currently deferred from grazing. The Mormon Mountain project area is managed on deferred rotational and deferred rest rotation grazing systems designed to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative impacts. Generally, projects are designed to move toward the desired conditions for northern goshawks as identified in the Forest Plan. Cumulatively, these projects and activities may impact northern goshawks but are not likely to cause a trend toward listing or loss of viability.

Determination of Effect

Although there are many positive effects, Alternative 2 would also have some negative effects to northern goshawk. Alternative 2 would largely benefit goshawks by improving habitat and moving toward a more uneven-aged structure with greater understory composition and reduced fire behavior. However, the loss of snags within drainages in the Orion PFA for corridor construction and the loss of snags in LOPFAs would have a minimal negative impact to important habitat components. Hauling activities on main haul routes could occur within 0.3 mile of nest stands, potentially impacting nesting goshawks within the Schultz and Thicket PFAs. Thinning activities in PFAs during the breeding season could impact nesting however; disturbance would be limited to two breeding seasons. Project activities may impact northern goshawks but are not likely to cause a trend toward listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects

Effects to northern goshawk habitat would be similar to those described under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistent due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. Helicopter logging would occur in the Orion PFA under this alternative, which would remove all snags on steep slopes within the 39 acres of the PFA. In addition, snags would also be removed in areas LOPFAs where helicopter logging is proposed. A design feature would require biologists to identify patches of snags up to 10 acres in size to allow for retention of some snags in these areas. Not taking into account these patches, there would be approximately 1,251 acres of LOPFAs where all snags could be removed to provide for safety.

The use of helicopter logging would require landings where trees are processed at the landing area with a processor. Helicopter paths would be reviewed to exclude flights over occupied nest locations during the northern goshawk breeding season (see Design Features specific to Alternative

3).

Under Alternative 3, there would be fewer miles of temporary roads needed within PFAs and LOPFAs than for Alternative 2 (see Table 22 for Alternative 2 and Table 23 for Alternative 3), reducing short term ground disturbance in these habitats.

Table 23: Alt. 3 - Miles of Temporary Roads in NOGO Habitat

Area	Miles of Temp Road/Relocated Road in PFAs	Miles of Temp Road/Relocated Road in Nest Areas	Acres Harvested by Helicopter
Dry Lake Hills	1.1/.9	.2/.5	39
Mormon Mtn.	.3/.3	.2/0	0
Total in PFAs	.9/1.2	.4/.5	39
Outside of PFAS	DLH – 11.1/.2 MM – 2.4/.2	N/A	1,251

Cumulative Effects
The cumulative effects are the same as in Alternative 2.

Determination of Effect
Although there are many positive effects, Alternative 3 would also have some negative effects to northern goshawk. Alternative 3 would largely benefit goshawks by improving habitat and moving toward a more uneven-aged structure with greater understory composition and reduced fire behavior. However, the loss of snags within the Orion PFA for safety purposes in areas harvested by helicopter would have a minimal negative impact to important habitat components. Helicopter operation could occur within the Orion PFA during the breeding season. Hauling activities on main haul routes could occur within 0.3 mile of nest stands, potentially impacting nesting goshawks within the Schultz and Thicket PFAs. Project activities may impact northern goshawks but are not likely to cause a trend toward listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Alternative 4 would treat 73 acres less in PFA habitat than the other action alternatives. This alternative would not include treating within the Orion PFA; only those treatments previously approved through the Jack Smith Schultz Forest Health and Fuels Reduction project would occur. There would also be 4,100 acres that would not be treated, and therefore those acres would not be developing toward a more uneven-aged structure.

Effects from Ground Disturbance
Ground disturbance would be primarily from mechanical operations, construction of landings and temporary roads. Table 24 summarizes the miles of temp roads and road reconstructions in northern goshawk habitats.

Table 24 Alt. 4 - Miles of Temporary and Relocated Roads in NOGO Habitat

PFA Name	Miles of Temp Road/Relocated Road in PFAs	Miles of Temp Road/Relocated Road in Nest Areas
Dry Lake Hills	.5/.9	.22/.5
Mormon Mtn.	.3/.3	.2/0
Total in PFAs	.9/1.2	.4/.5
Outside of PFAS	DLH – 9.1/.2 MM – 2.4/.2	N/A

Alternative 4 would not require cable corridors, cable or helicopter logging to accomplish thinning treatments reducing the site specific loss of snags. Less area would be treated mechanically requiring less ground disturbance than the other action alternatives. The number of temporary roads would also be less than the proposed action resulting in less short term disturbance to prey habitat.

Disturbance from Project Implementation

This alternative would have the least amount of disturbance from project implementation. There would be no disturbance from helicopter operations, steep-slope machinery or cable logging operations. Although the same haul routes would be used, fewer vehicle trips would be required and the duration of the project would be shorter than the other action alternatives.

Cumulative Effects

Cumulative effects are the same as alternative 2 and 3, but to a lesser degree due to fewer acres being treated**.**

Determination of Effect

Although there are many positive effects, Alternative 4 would also have some negative effects to northern goshawk. Alternative 4 would largely benefit goshawks by improving habitat and moving toward a more uneven-aged structure with greater understory composition and reduced fire behavior. Hauling activities on main haul routes could occur within 0.3 mile of nest stands during the breeding season, potentially impacting nesting goshawks within the Schultz and Thicket PFAs. Project activities may impact northern goshawks but are not likely to cause a trend toward listing or loss of viability.

American Peregrine Falcon

Analysis Methods

The following evaluation criteria were used to compare environmental consequences for all alternatives:

- Prey species habitat
- Disturbance from project implementation

Existing Conditions

The peregrine falcon was removed from the Federal List of Endangered and Threatened Wildlife in August 1999 and is now a Forest Service Sensitive species. The essential habitat for peregrine falcon includes rock cliffs for nesting and a large foraging area. Suitable nesting sites on rock cliffs have a mean height of 200 to 300 feet. Peregrines occur state-wide as migrant, transient and/or wintering individuals. The subspecies *anatum* breeds here on selected isolated cliff ledges and is a permanent resident on the Coconino National Forest. The Mormon Mountain project area lacks steep cliff sites potentially suitable for nesting by this species. The

Dry Lake Hills project includes one eyrie within the project, northwest of the Devils Head communication facility, and another approximately 0.6 mile east of the project area on the southern face of Mt. Elden. Peregrines prey mainly on birds found in wetlands, riparian areas, meadows, parklands, croplands, mountain valleys, and lakes within a 10 to 20 mile radius from the nest site. Peregrines likely forage in the Dry Lake Hills project area. Prey species include bats, mammals and birds. The peregrine breeding season is from March 1 to August 15.

Direct and Indirect Effects

Alternative 1 – No Action Alternative

Under the No Action Alternative, there would be no direct or indirect effects to peregrines. There would be no change to the prey species base, and no change in falcon hunting patterns within associated forest structure.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to peregrine falcon habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place peregrine falcon habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow, fuel would continue to accumulate, and the impacts of climate change would continue to affect forest health, thus continuing to have negative effects to peregrine falcon.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Peregrines could be directly impacted if project activities disturb breeding birds. No treatments are proposed at the peregrine eyrie within the project, and direct effects from thinning or burning are not expected because no thinning or burning activities would take place within one-quarter mile of an active eyrie during the breeding season (see Design Features). No direct or indirect effects are expected to the East Elden eyrie due to the distance from the project and the location of the eyrie in an area where smoke is not anticipated to settle.

Under Alternative 2, there would be indirect effects from the modification of vegetation. Thinning could adversely affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from fire. However, over the long- term, an increased diversity of vegetative structural stages and improved understory vegetation would increase prey species, resulting in indirect beneficial impacts. Thinning of the forest would increase sight distance for foraging peregrine falcons, which facilitates hunting conditions, resulting in an indirect beneficial impact.

Cumulative Effects

Under Alternative 2, there would be an additive effect from activities that modify vegetation. Other projects where thinning occurs could affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from fire. However, projects would be implemented at different times and different locations, thus disturbances to the prey base would be minimized. An additional cumulative effect includes unmanaged climbing in areas where peregrine falcons are known to nest. In the last ten years, rock climbing has doubled, which could result in peregrine nesting success. Cumulatively, these projects and activities may impact peregrine falcons but are not likely to cause a trend toward listing or loss of viability.

Determination of Effect
The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects
Effects to peregrine falcon habitat are similar as those discussed for Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistent due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery.

As a result of harvesting by helicopter, snags would be removed from 972 acres of foraging habitat, which could affect the distribution of bats, birds and small mammals. However this would have little impact to peregrines due to the large area available for foraging in the 10-20 mile radius of the known nest sites.

The use of helicopter logging would require landings where trees are processed at the landing area with a processor. Ellis and Ellis (1991) indicate that buffer zone of 500-m (1638ft) or less for helicopter overflights would minimize flush response and any potential effects on nesting habitat. The recommendation of no activities within one-quarter mile of an occupied eyrie would include helicopter use to limit disturbance to nesting birds. An implementation guide would be developed prior to implementation to ensure helilandings and helicopter flight patterns limit disturbance to nesting peregrines (see Design Features).

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Determination of Effect
The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to peregrine falcon habitat would be similar as the other action alternatives; however there would be a total of 3,459 acres of vegetation treatment in peregrine falcon habitat within the Dry Lake Hills project area, 2,504 acres less than the other action alternatives. The distribution of snags and large trees would be more consistent due to the absence of cable corridors and areas harvested by cable or helicopter logging.

Under Alternative 4, there would be less foraging habitat with improved vegetative structural stages and understory diversity, although there would still be an indirect beneficial affect for peregrines.

Cumulative Effects
Cumulative effects are the same as Alternative 2, though to a lesser degree as fewer acres would be treated.

Determination of Effect

The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Navajo Mogollon Vole

Analysis Methods

The following evaluation criteria were used to compare environmental consequences for alternatives:

- Amount and distribution of habitat
- Disturbance from project implementation

Existing Conditions

Navajo Mogollon voles occupy meadows and riparian areas above the Mogollon Rim associated with ponderosa pine or other coniferous forests. They also occur within forested areas where tree densities are low. They rely on grasses and other herbaceous vegetation for food or cover. Vole runways have not been documented in the project area; however, vole populations likely occur in the project area. Potentially suitable habitat within the project area is currently 60 acres of grassland habitat, and any openings within the ponderosa pine and mixed conifer.

Alternative 1 – No Action Alternative

Direct and Indirect Effects

Under the No Action Alternative, there would be no disturbance and no direct effects. Although habitat would continue to be provided for this species, most of the forested area within the project is currently in a moderately-closed to closed condition, which provides low quality habitat for the Mogollon vole. Under the No Action Alternative, openings would not be created and canopy closure would not be reduced, thus there would no benefits to the vole. Favorable habitat would decrease over time as conifers encroach into meadows and canopy closure increases, resulting in an indirect adverse effect. In addition, high fire hazard potential would persist, and a large crown wildfire event would have the potential to affect many individuals.

Loss of vegetative cover removes food and shelter for voles and this alternative would have the highest level of loss or degradation in grasslands and vegetation types used by this vole.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to vole habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place vole habitat and adjacent habitat at risk of stand-replacing fire. Climate change would continue to contribute to this risk. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have a negative effect on Navajo Mogollon vole.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Under Alternative 2, thinning and broadcast burning and ground disturbing activities may disturb individual voles, resulting in direct adverse effects. Broadcast burning, harvest activities,

temporary road construction and corridors would result in the removal of cover and food; it is anticipated that grasslands, open areas and rehabilitated roads would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. Additionally, such activities would occur across the project area at different times; thereby reducing impacts to this species. In addition, the effect would be short-term, generally one year, depending on climate and moisture. The reduction of dense forest canopy and increased growth in the herbaceous vegetation on the forest floor would result in indirect beneficial impacts to the vole. Forest conditions after treatment would improve vole habitat within the project area.

Temporary roads construction would disturb four acres of grassland habitat, and the designation of use for administrative purposes would continue to permanently reduce the quality of this unique habitat for voles.

This alternative would provide the most habitats for voles than the other alternatives due to the proposed treatments in mixed conifer and ponderosa pine opening the canopy, and also the creation of cable corridors, which would provide additional food and cover for voles.

Cumulative Effects

Recreation (e.g., hiking, biking, and camping) and road travel pose an adverse effect to voles due to soil and vegetation disturbance and soil compaction. This would combine with the Mount Elden Dry Lake Hills Recreation Planning Project's proposed action to reduce vole habitat. Recreational activities would continue to occur in the project area, resulting in decreased habitat for voles; however, forest management practices that promote herbaceous growth could lead to increased vole populations. There are additive effects of reduction of understory vegetation by livestock grazing in the Mormon Mountain project area. Livestock grazing would combine with short-term loss of understory vegetation from burning and harvest activities. The Mormon Mountain project area is managed on a deferred rotational and rest rotational grazing system designed to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative effects. Development of private and state land has the greatest potential impact to vole habitat. Cumulatively, these projects and activities may impact the Navajo Mogollon vole but are not likely to cause a trend toward listing or loss of viability.

Determination of Effect

Although there are many positive effects, Alternative 2 would have some short term negative effects to Mogollon vole. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects

Effects to Mogollon vole habitat are similar to those described for Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be fewer openings due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. No cable logging would occur under this alternative, which would reduce the need to remove the large trees and logs on steep slopes and also the need to create corridors. Large snags cut for safety would be left on site, improving habitat. As with Alternative 2, this alternative would permanently impact four acres of grassland habitat with construction of a temporary road and the designation to

maintain it for administrative use.

This alternative would provide more vole habitat than Alternative 1 but less than Alternative 2 as additional habitat would not be produced by creating corridors.

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Determination of Effect
Although there are many positive effects, Alternative 3 would have some short term negative effects to Mogollon vole. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to Mogollon vole habitat are similar to those discussed for Alternatives 2 and 3 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be fewer openings due to the absence of proposed cable corridors. This alternative would treat 3,080 acres less habitat than the other action alternatives, including seven less acres of grassland treatment, and so providing the least habitat improvement for this vole. As discussed under the other action alternatives, Alternative 4 would permanently impact four acres of grassland habitat with construction of a temporary road and the designation to maintain it for administrative use.

Cumulative Effects
Cumulative effects are the same as Alternative 2 and 3.

Determination of Effect
Although there are many positive effects, Alternative 4 would have some short term negative effects to Mogollon vole. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Allen's Lappet-browed Bat

Analysis Methods
The following evaluation criteria were used to compare environmental consequences for all alternatives:

- Amount and distribution of habitat
- Disturbance from project implementation

Existing Conditions
Allen's lappet-browed bats have been found in a variety of habitats in Arizona, including ponderosa pine, pinyon-juniper, Mexican woodland, white fir forests and Mohave desertscrub. They are often associated with water, whether for feeding or drinking, or both is unclear. Surveys of two tanks within the project area were completed the summer of 2013 with eleven different bat species captured. Allen's lappet-browed bats were not detected during these efforts. Hoffmeister (1986) documents Allen's lappet-browed bats occupying mine shafts or rocky areas and cliffs for roosts. In 2007, a bat roost inventory and monitoring project compiled, located and inventoried bat roosts in Arizona Game and Fish Region 2 and identified current and potential threats and management needs (Solvesky and Chambers 2009). All of the Coconino National Forest was

included within the Region 2 boundaries. Several ephemeral tree/snag roosts were located on the Forest. Models that predicted the probability of snag use as a maternity roost indicated Allen's lappet-browed bats selected taller snags closer to forest roads (Solvesky and Chambers 2009). It is unclear as to why bat roosts are most likely to be located near roads, although the authors speculate that the roads provide clearing for flight corridors of the bats. Suitable habitat would be large snags used for roosting and foraging habitat including areas with water and insects. The presence and regeneration of snags and/or dead and dying trees with loose bark, dispersion of habitat types and structure within habitat including openings, montane meadows, or openings with wet soils with diverse vegetative herbaceous ground cover and species composition to support prey items. Pools, tanks, and openings with wet ground also support prey. There are approximately 6,260 acres of ponderosa pine, 4,169 acres of mixed conifer and 60 acres of grassland within the FWPP.

Alternative 1 - No Action Alternative

Direct and Indirect Effects

Under the No Action Alternative, there would be no disturbance and no direct effects to Allen's lappet-brown bats. Habitat would still exist for this species; however, the high fire hazard potential would persist, and a large crown wildfire event could have the potential to affect individuals, resulting in indirect adverse effects.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to bat habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions and the effects of climate change would continue to place bat habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have a negative effect to Allen's lappet-browed bat.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Under Alternative 2, thinning and broadcast burning activities could potentially disturb bats if they are roosting in snags within the project area. Allen's lappet-browed bats rely on snags for ephemeral roosts and are thought to select taller snags closer to forest roads as maternity roosts, and so are vulnerable to increased harvest of these structures along roads, (Solvesky and Chambers 2009, Wisdom and Bate 2008). This alternative would result in the greatest decrease in snags by cutting cable corridors, removing snags for safety and burning on the most acres. However mitigation includes protection of snags through site prep, implementation planning and ignition techniques and the identification of patches of snags up to 10 acres in size to serve as a reserve from areas where we are unable to maintain snags. The physical appearance of corridors may provide similar habitat characteristics of roads for bats and may provide additional habitat for this species.

Alternative 2 is expected to result in a slight short-term decrease in snags followed by an increase over the long-term at the project level, but with a long-term decrease of snags in corridors and areas harvested by cable logging. Snags and recruitment snags would be removed to create corridors and snags would be removed in areas harvested by cable logging. However this loss of snags is not expected to affect the overall distribution of Allen's lappet-browed bats on the forest.

Broadcast burning would result in the removal of cover and food; however it is anticipated that

meadows and open areas would rebound afterwards with more vigorous herbaceous vegetation and healthier understory habitats.

Under Alternative 2, there would be indirect effects from the modification of vegetation. Thinning, burning, construction of temp roads and corridors could adversely affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from fire. However, over the long- term, an increased diversity of vegetative structural stages and improved understory vegetation would increase prey species, resulting in indirect beneficial impacts.

Skyline logging uses a system of cables to drag logs of whole trees from the cutting unit to a roadside landing. It is used on sites that are too steep for ground based operations. Roughly parallel "corridors" for the skyline needs to be placed every 100' to 140'. These corridors are approximately 12' wide and must have all trees removed from them to facilitate yarding. Much of this area contains large (>24" DBH) pre-settlement trees and snags. Roughly 241 acres of potential roosting habitat would be denuded by cable corridors..

In addition, cable logging requires that all hazard trees are removed from the entire area that is cable logged to provide for safety of personnel on the ground outside of protected machinery. A design feature requires biologists to identify patches of snags up to 10 acres in size to allow for retention of some snags in these areas. Not taking into account these patches, there would be approximately 1,049 acres in potential bat roosting habitat where all snags could be removed to provide for safety.

These effects would primarily result in effects of localized extent. The reduction of dense forest canopy and creation of edges by creating corridors would increase growth in herbaceous vegetation on the forest floor, resulting in indirect beneficial impacts to bats. Maintaining or creating snags post-implementation in key areas along openings and corridors may provide additional habitat for this bat. Forest conditions after treatment would improve bat habitat within the project area.

Overall, the project is designed to grow trees into larger size classes, providing more recruitment snags over the long term. Snag densities on a project level scale would not change considerably. This alternative would reduce bat roosting habitat but at the same time would create more improved foraging habitat than Alternative 4. Snags in key areas (such as south and southwestern slopes in the Dry Lake Hills) would not change for any of the alternatives because we are not proposing treatments in those areas.

Cumulative Effects

The cumulative effect area considered is the project, and all projects (past, present and reasonably foreseeable) as listed in Appendix D that have the potential to impact Allen's lappet-browed bats were analyzed. Ungulate grazing within the project area reduces understory vegetation, which reduces plant availability to adult insects, a primary food source. The Dry Lake Hills has been deferred from grazing and has not been grazed by cattle in over 10 years. The Mormon Mountain project area is managed on deferred rotational and deferred rest rotation grazing systems designed to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative impacts. Other projects that may add to the loss of snags include powerline maintenance and removal of hazard trees along roads and trails. Cumulatively, these projects and activities may impact Allen's lappet-browed bat but are not likely to cause a trend toward listing or loss of viability.

Determination of Effect

Although there are positive effects, Alternative 2 would also have some negative effects. Alternative 2 would largely benefit Allen's lappet-browed bat by improving understory diversity and increasing prey habitat across the project. There would be a loss of snags and recruitment snags in concentrated areas where corridors are constructed and areas are harvested by cable logging; however at a project level, snag loss would be minimal. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects

Effects to Allen's lappet-browed bat habitat are similar as under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistent due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. There would be 972 acres harvested by helicopter logging in Allen's lappet-browed bat habitat, which would reduce snags on steep slopes and reduce potential roosting habitat. This loss of snags is not expected to affect the overall distribution of Allen's lappet-browed bats on the forest.

Alternative 3 would provide slightly less bat roosting habitat than Alternative 1 and more than Alternative 2 as no cable corridors would be required. On the other hand, this alternative would create less foraging habitat than Alternative 2 with reduced openings for corridors.

Cumulative Effects

Cumulative effects are the same as Alternative 2.

Determination of Effect

The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects

This alternative would treat approximately 3,118 fewer acres of habitat than the other actions alternatives, providing the least habitat improvement for this bat. However, under Alternative 4, snags would not be targeted for removal as there would be no cable or helicopter logging.

Cumulative Effects

Cumulative effects are the same as Alternative 2 and 3, but to a slightly lesser degree as fewer acres would be treated.

Determination of Effect

Although there are mostly positive effects, Alternative 4 would also have some negative effects. Alternative 4 would largely benefit Allen's lappet-browed bat by improving understory diversity and increase prey habitat across the project where treatments are proposed. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Pale Townsend's Big-eared Bat

Analysis Methods

The following evaluation criteria were used to compare environmental consequences for alternatives:

- Amount and distribution of habitat
- Disturbance from project implementation

Existing Conditions

The pale Townsend's big-eared bat is found statewide and throughout the Western U.S and south into Mexico. Habitat includes caves, mines, lava tubes and abandoned buildings. The population is apparently secure, although is thought to be declining due to loss of habitat in caves and mines (AZGFD 2003). They may be found in desert scrub, coniferous forest, pinyon-juniper, pine-oak and oak woodland. Habitat used is ponderosa pine with the presence and regeneration of large snags and/or dead and dying trees with loose bark, cavity-forming rock, dispersion and size of openings and meadows within ponderosa pine, mixed conifer and pinyon juniper with diverse vegetative herbaceous ground cover and species composition to support prey items. Forest edges for foraging, pools, tanks, and openings with wet ground also support prey.

A 2007 bat roost inventory and monitoring project compiled, located and inventoried bat roosts in Arizona Game and Fish Region 2 and identified current and potential threats and management needs (Solvesky 2007). All of the Coconino National Forest was included within the Region 2 boundaries. Townsend's big-eared bats were documented to use caves on the Flagstaff and Red Rock Districts. No roosts were located within the project area. There are two documented caves within the Dry Lake Hills project area; however no bat use has been recorded. Surveys of two tanks within the project area were completed the summer of 2013 with eleven different bat species captured. Townsend's big-eared bats were not detected during these efforts. Townsend's big-eared bats were not documented using ephemeral trees/snags as roosts on the Coconino, although they likely do. Potential habitat within the project area includes approximately 6,260 acres of ponderosa pine habitat and 4,169 acres of mixed conifer habitat.

Alternative 1 - No Action Alternative

Direct and Indirect Effects

Under the No Action Alternative, there would be no disturbance and no direct effects. Low-quality foraging habitat would still exist for this species; however, the high fire hazard potential would persist, and a large crown wildfire event could have the potential to affect individuals, resulting in indirect adverse effects.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to bat habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place bat habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have a negative effect to Pale Townsend's big-eared bat.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Roughly 241 acres of potential roosting habitat would be denuded by cable corridors under this alternative. In addition, cable logging would require that all hazard trees be removed from the entire area that is cable logged to provide for safety of personnel on the ground outside of

protected machinery. A design feature would require biologists to identify patches of snags up to 10 acres in size to allow for retention of some snags in these areas. Not taking into account these patches, there would be approximately 1,049 acres in potential bat roosting habitat where all snags could be removed to provide for safety.

These effects would primarily result in effects of localized extent. Overall, the project is designed to grow trees into larger size classes, providing more recruitment snags over the long term. Snag densities on a project-level scale would not change considerably. Alternative 2 would reduce bat roosting habitat, but at the same time would create more improved foraging habitat than Alternative 4. Snags in key areas such as south and southwestern slopes in the Dry Lake Hills would not change for any of the alternatives as no treatments are proposed in these areas.

Broadcast burning, corridor and temporary road construction would result in the removal of cover and food; however it is anticipated that meadows, open areas and rehabilitated roads would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. Indirect effects would result from vegetation modification activities such as thinning, broadcast burning and ground disturbing activities. These activities would disturb or remove understory vegetation, subsequently reducing availability to insects. These effects would be short-term and would be minimized due to activities being temporally and spatially separated. In contrast, reducing canopy closure, removing trees in corridors and creating edges, restoring meadows and broadcast burning would encourage the development of understory vegetation, increasing availability of food for this bat over the long-term.

Cumulative Effects

The cumulative effects area considered is the project area and all projects (past, present and reasonably foreseeable) that have the potential to impact Pale Townsend big-eared bats were analyzed. Ungulate grazing within the project area reduces understory vegetation, which reduces plant availability to adult insects, a primary food source. The Dry Lake Hills project area has been deferred from grazing and has not been grazed by cattle in over 10 years. The Mormon Mountain project area is managed on deferred rotational and deferred rest rotation grazing systems designed to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative impacts. Cumulatively, these projects and activities may impact Pale Townsend's big-eared bat but are not likely to cause a trend toward listing or loss of viability.

Determination of Effect

Although there are mostly positive effects, Alternative 2 would also have some negative effects. Alternative 2 would largely benefit Pale Townsend's big-eared bat by improving understory diversity and increase prey habitat across the project. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects

Effects to Pale Townsend's big-eared bat habitat would be similar as under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistent due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. There would be 972 acres harvested by helicopter logging in Pale Townsend's big-eared bat habitat, which would reduce snags on steep slopes and reduce

potential roosting habitat. This loss of snags is not expected to affect the overall distribution of Pale Townsend's big-eared bats on the forest.

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Determination of Effect
Although there are mostly positive effects, Alternative 3 would also have some negative effects. Alternative 3 would largely benefit Pale Townsend's big-eared bat by improving understory diversity and increase prey habitat across the project. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
This alternative would treat 3,111 fewer acres of habitat than the other action alternatives providing the least overall habitat improvement for this bat. There would be fewer acres treated in the Dry Lake Hills project area, limiting the ability to create openings within the forest canopy to provide for more understory diversity in both the ponderosa pine and mixed conifer habitats.

Cable and helicopter logging would not occur, reducing the number of snags needed to be cut for safety purposes and thereby reducing the potential for site specific impacts.

Cumulative Effects
Cumulative effects are the same as Alternative 2 and 3, but to a slightly lesser degree as fewer acres would be treated.

Determination of Effect
Although there are mostly positive effects, Alternative 4 would also have some negative effects. Alternative 4 would largely benefit Pale Townsend's big-eared bat by improving understory diversity and increase prey habitat across the project. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Spotted Bat

Analysis Methods
The following evaluation criteria were used to compare environmental consequences for alternatives:

- Amount and distribution of habitat
- Disturbance from project implementation

Existing Conditions
Historic records suggest that the spotted bat was widely distributed but quite rare over its range, although it may have been locally abundant at certain sites. The historic range of the spotted bat includes Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Wyoming, Texas, Canada and Mexico. Roost site characteristics are poorly known for this species, but limited observations suggest that spotted bats roost singly in crevices, with rocky cliffs and surface water characteristic of localities where they occur. It has been found from low desert areas in southwestern Arizona to high desert and riparian habitat in the northwestern part of the state. It has also been found in conifer forests in northern Arizona (Kaibab Plateau) and other western states. There are no roost locations known to occur on the Forest. This species is a habitat generalist and could forage across the entire Forest.

Alternative 1 - No Action Alternative

Direct and Indirect Effects
Under the No Action Alternative, there would be no disturbance and no direct effects. Low-quality foraging habitat would still exist for this species; however, the high fire hazard potential would persist, and a large crown wildfire event could have the potential to affect individuals, resulting in indirect adverse effects.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to bat habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place bat habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have a negative effect to spotted bat.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Under Alternative 2, disturbance to the spotted bat from thinning and prescribed burning activities is highly unlikely. Isolated occurrences of disturbance may impact individuals but because this bat roosts singly, proposed activities would not have an impact on an entire colony of spotted bats.

Broadcast burning would result in the removal of cover and food; however it is anticipated that meadows and open areas would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. Indirect effects would result from vegetation modification activities such as thinning and prescribed burning and ground disturbing activities (cable corridors, temporary roads and landings). These activities would disturb or remove understory vegetation, subsequently reducing availability to insects. These effects would be short-term and would be minimized due to activities being temporally and spatially separated. In contrast, reducing canopy closure, removing trees in corridors and creating edges, restoring meadows and broadcast burning would encourage the development of understory vegetation, increasing availability of food for the bat over the long-term.

Cumulative Effects
The cumulative effects area considered includes the project area and all projects (past, present and reasonably foreseeable) that are within the project area that have the potential to impact spotted bats were analyzed. Ungulate grazing within the project area reduces understory vegetation, which reduces plant availability to adult insects, a primary food source. Approximately half of the project area is currently not being grazed by livestock and the remainder is managed on a rotational grazing system designed to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative impacts. Cumulatively, these projects and activities may impact spotted bat but are not likely to cause a trend toward listing or loss of viability.

Determination of Effect
Although there are mostly positive effects, Alternative 2 would also have some short-term negative effects from disturbance during implementation. Alternative 2 would largely benefit spotted bat by improving understory diversity and increase prey habitat across the project. The project's activities

may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects
Effects to spotted bat habitat are similar as under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistent due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. Helicopter logging would be used on steep slopes which would require the removal of snags on approximately 972 acres of spotted bat foraging habitat, all within the Dry Lake Hills area.

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Determination of Effect
Although there are mostly positive effects, Alternative 3 would also have some negative effects. Alternative 3 would largely benefit spotted bats by improving understory diversity and increase prey habitat across the project. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to spotted bat habitats are similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same. However there would be no helicopter or cable logging, so there would be no added effect from the loss of snags within these areas.

Cumulative Effects
Cumulative effects are the same as Alternative 2 and 3, but to a slightly lesser degree as fewer acres would be treated.

Determination of Effect
Although there are mostly positive effects, Alternative 4 would also have some negative effects. Alternative 4 would largely benefit spotted bat by improving understory diversity and increase prey habitat across the project. The project's activities may impact individuals but is not likely to cause a trend toward listing or loss of viability.

Northern Leopard Frog

Analysis Methods
The following evaluation criteria were used to compare environmental consequences for alternatives:

- Impacts to potential habitat

Existing Conditions
There is no known existing or historic locations of northern leopard frogs within the project, though livestock tanks in the project area provide potential habitat for northern leopard frogs throughout the year. According to the Coconino National Forest Natural Resource Information System database (NRIS), there are three waters with potential habitat for leopard frogs: Schultz Tank, Pushout Tank, and Weimer Spring. Dry Lake Tank, within the project area but located on

private land, may provide additional habitat. Because of the high potential for northern leopard frogs near the Mormon Lake area, tanks and springs within one-half mile of the Mormon Lake project and within the project's watershed were surveyed in 2013. Of the 44 tanks surveyed, one tank, within a half mile of the Mormon Mountain project area, was found to have northern leopard frogs present.

Chytrid fungus and non-native predators have been identified as major mechanisms causing declines in northern leopard frogs across their range.

Alternative 1 – No Action

Direct and Indirect Effects

Under the No Action Alternative, habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect on Northern leopard frog. However, dense forest conditions would still occur and the high fire hazard potential would persist. Large crown-wildfires could adversely affect potential habitat by destroying understory and overstory vegetation. As a result overland flow would increase, and soil erosion would increase with potentially high sediment loads. Water quality would be adversely affected on a wide-scale basis, and potentially in occupied habitat within the Mormon Mountain/Lower Lake Mary Watershed, resulting in indirect adverse effects.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to northern leopard frog habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place frog habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have an adverse effect to northern leopard frog.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Under Alternative 2, there would be no direct effects to northern leopard frog eggs, larvae, or adults from project activities as leopard frogs are not present within the project, and implementation of soil and watershed best management practices (BMPs) would curtail soil erosion and minimize inflow into potential leopard frog habitat. Indirect effects would be from reducing the potential for stand-replacing wildfire within the Mormon Mountain project area and thereby reducing the potential of adverse impacts to leopard frog habitat within the Lower Lake Mary Watershed.

Cumulative Effects

Alternative 4 would add to other past and reasonably-foreseeable projects within the Lower Lake Mary Watershed that have or are planned to reduce the potential for stand-replacing wildfires, thereby reducing the potential for adverse effects from increased overland flow and soil erosion with potentially high sediment loads in potential and occupied habitat within the Lower Lake Mary Watershed, resulting in indirect beneficial effects.

Determination of Effect

Alternative 2 would largely benefit northern leopard frogs by reducing the potential for stand replacing wildfires, thereby reducing the potential adverse effects to habitat. Although project

activities could cause increased soil erosion with potential sediment loads in potential and occupied habitat, BMP's would curtail soil erosion and minimize effects. The project's activities may impact northern leopard frog but would not lead to a trend to listing or loss of viability.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects
Effects to northern leopard frog habitat are the same as under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same. Although this alternative uses different harvest methods, the impacts to northern leopard frog habitat outside of the project area would be the same.

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Determination of Effect
Alternative 3 would largely benefit northern leopard frogs by reducing the potential for stand replacing wildfires thereby reducing the potential adverse effects to habitat. Although project activities could cause increased soil erosion with potential sediment loads in potential and occupied habitat, BMP's would curtail soil erosion and minimize effects. Alternative 4's activities would have no direct impacts to the northern leopard frog. The project's activities may impact northern leopard frog but would not lead to a trend to listing or loss of viability.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to northern leopard frog habitat are similar as Alternative 2 and 3 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same. Although this alternative would treat fewer acres and would not use cable or helicopter logging, the expected impacts from soil erosion due to ground-based machinery would be curtailed by implementation of BMP's.

Cumulative Effects
Cumulative effects are the same as Alternatives 2 and 3.

Determination of Effect
Alternative 4 would largely benefit northern leopard frogs by reducing the potential for stand replacing wildfires thereby reducing the potential adverse effects to habitat. Although project activities could cause increased soil erosion with potential sediment loads in potential and occupied habitat, BMP's would curtail soil erosion and minimize effects. The project's activities would have no direct impact to the northern leopard frog. The project's activities may impact northern leopard frog but would not lead to a trend to listing or loss of viability.

Snags and Logs

Snags and logs are important elements of the structure and function of ponderosa pine, mixed conifer and aspen, and are also important to bird and small mammal communities.

Analysis Methods
The following evaluation criteria were used to compare environmental consequences for alternatives:

- Snag and log densities

- Snag and log locations

Forest Plan Standards and Guidelines

For areas outside of PFAs (snags are 18" or larger dbh and 30'or larger in height, logs are 12" dbh and at least 8' in length)

- Ponderosa pine - Leave at least 2 snags, 3 downed logs, and 5-7 tons of woody debris per acre.
- Mixed conifer, Spruce - fir – Leave at least 3 snags, 5 downed logs and 10-15 tons of woody debris per acre.
- Aspen- Retain trees greater than 12 inches diameter at breast height (dbh) and nest trees. Within 10K blocks at least 50 percent of the forested land meets 2 snags per acre. In high priority areas including both edge habitats adjacent to meadows or water and interior stands, manage for an average of 2.8 snags per acre. Provide for down woody debris.

For areas within MSO Recovery or Protected habitat:

- Retain substantive amounts of snags 18 inches in diameter and larger and down logs over 12 inches midpoint diameter

Existing Conditions

Project (Ecosystem Management Area)

In 2002 the Forest estimated that trends for snags in ponderosa pine habitats were probably declining (USDA Forest Service 2002a). However, a recent study by Ganey and Vojta (2007) conducted on the Coconino and Kaibab National Forests within the ponderosa pine and mixed conifer habitats indicates that, at least in the short term, snag numbers are increasing and would continue to increase and densities of large snags would increase (Ganey and Vojta 2007). Despite these increases, densities of large snags (greater than 18 inches dbh) would remain below Forest Plan guidelines. The models used by Ganey and Vojta provide a useful tool for modeling snag dynamics at a landscape scale but are not suitable for modeling snag dynamics at the stand level. Snag and log data were collected for both the FWPP project areas. Snags greater than 12 inches dbh and greater than 18 inches dbh meet Forest Plan standards for the project area.

Cover Type (Mid-Scale)

At the mid-scale level, snags greater than 12 inches dbh meet Forest Plan standards in all cover types across the FWPP area; however, snags greater than 18" diameter are below standards in the mixed conifer and aspen cover types in the Dry Lake Hills and the ponderosa pine cover type in Mormon Mountain. In ponderosa pine, the average density of snags greater than 18 inches dbh per acre in is 2.1 in the Dry Lake Hills and 0.7 in Mormon Mountain. In mixed conifer, the average density of snags greater than 18 inches dbh per acre is 2.4 in Dry Lake Hills and 9.3 in Mormon Mountain. For aspen, the average density of snags greater than 18 inches dbh per acre is 0.1 in the Dry Lake Hills area; there is no aspen cover type on Mormon Mountain.

Site/Stand Level (Small Scale)

Snag data was not collected for every stand in the project; however, the data collected shows that not all stands meet the Forest Plan guidelines.

Direct and Indirect Effects

Table 25 below summarizes the existing snags (Alt.1) and the change in snag densities for each alternative immediately after treatment. Appendix B, Tables 2 and 3 summarize the snag densities

by alternative 20 and 40 years post-treatment.

Table 25: Snags/acre ≥ 18" diameter breast height (dbh) and ≥ 12" DBH immediately after treatment by alternative

	Description	Snag Size	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Project Area	Dry Lake Hills	≥12”	6.4	5.1	5.1	5.5
		≥18”	2.2	2.2	2.1	2.2
	Mormon Mountain	≥12”	10.6	10.1	10.5	10.8
		≥18”	3.6	3.5	3.7	3.7
Cover Type Dry Lake Hills	Ponderosa Pine	≥12”	3.6	3	3.2	3.3
		≥18”	2.1	1.9	1.9	1.8
	Mixed Conifer	≥12”	8.8	7.4	6.8	8.4
		≥18”	2.4	2.4	2.3	2.6
	Aspen	≥12”	19.9	19.9	19.9	19.9
		≥18”	.1	.1	.1	.1
Cover Type Mormon Mountain	Ponderosa Pine	≥12”	3.9	4.6	4.6	4.6
		≥18”	.7	.7	.7	.7
	Mixed Conifer	≥12”	23.4	20.9	22.2	22.4
		≥18”	9.3	8.4	9	9
	Wet Mixed Conifer	≥12”	25.8	21	21.4	25.8
		≥18”	12.1	11	11.2	12.1

Alternative 1 – No Action

Direct and Indirect Effects

Under the No Action Alternative, there are no treatment effects. Under the No Action Alternative, the high fire hazard potential in the project area would persist. In the event of a large crown-wildfire, widespread loss of snags and logs would occur. Generally, snags remaining after a crown-wildfire would have decreased longevity and value to wildlife. High tree densities would remain, limiting growth of large diameter trees and thereby limiting replacement snags and logs.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Snags and logs are important elements of the structure and function of ponderosa pine, mixed

conifer and aspen, and are important to bird and small mammal communities. Losses of snags and logs from prescribed burning in ponderosa pine and mixed conifer habitats would occur under this alternative; however, snags continue to fall and provide new logs on the forest floor. Fire damaged trees and recruitment snags would provide additional snags following prescribed fire.

Project Area (Landscape Scale)
Under Alternative 2, both project areas would meet Forest Plan guidelines immediately after treatment. Large snags (greater than 18 inches dbh) fall slightly below standards in Mormon Mountain 20 years post-treatment. At 40 years post-treatment snags begin to decline slightly for both project areas.

Cover Type (Mid-Scale)
Snags would continue to exceed standards and guidelines post-treatment in Mormon Mountain and would be slightly reduced in Dry Lake Hills.

For ponderosa pine, snags greater than 18 inches dbh would be reduced to just below Forest Plan guidelines immediately after treatment in the Dry Lake Hills, with no change in large snag densities in the ponderosa pine in Mormon Mountain.

For aspen, the post-treatment density of snags would remain the same immediately after treatment and 20 years post-treatment. Within 40 years there would be no aspen snags remaining due to loss of snags with no immediate recruitment of larger size classes.

None of the cover types currently meet the Forest Plan standard for snags at the mid-scale level. There may be an additional loss of snags from burning; however, burning may also create new snags. Overall the project is designed to grow trees into larger size classes providing more recruitment snags over the long term.

Site/Stand (Small Scale)
There would be a direct effect of loss of snags from corridors and a loss of snags from areas harvested by cable logging. Appendix C summarizes the acres of corridors and areas treated with cable logging.

In ponderosa pine there would be a loss of snags on approximately 378 acres, and in mixed conifer there would be a loss of snags on approximately 912 acres. Design features have been incorporated to provide for patches of snags up to 10 acres in size to serve as reserve areas within these units. Additionally, some snags cut for safety purposes would be left on site to provide increased logs where needed. This loss of snags would not meaningfully affect the average snags per acre on a landscape or project level, but it would have noticeable impacts on a site specific level. In addition, there would be a direct effect of loss of snags and logs during initial entry and maintenance prescribed fire; however, with the anticipated mortality associated with prescribed burning snags and logs would be created to offset the direct effect (Fuels and Fire Specialist Report). These effects would be minimized since snags necessary to meet wildlife management objectives would be fire-lined or replaced. Loss of large logs would be minimized though ignition techniques and possibly fire-lining.

Although fire can have a detrimental effect on pre-burn snags, it can cause live trees to die and become snags after fire. With the retention of yellow pine trees, recruitment snags and old growth recruitment site management, some trees would in time naturally convert to snags. This natural conversion of snags to logs would contribute to additional numbers of snags and logs on

the ground. The less competition between trees for moisture, nutrients, and sunlight, the larger they would grow prior to becoming snags. Larger diameter snags (greater than 18 inches dbh) are necessary to meet Forest Plan guidelines. Recruitment snags would be identified and retained from live trees that exhibit defects ideal for wildlife. For example, trees with spiked-tops, lightning strikes, mistletoe brooms, or fading crowns.

Alternative 2 would have the greatest impact to snags on a site/stand level.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects

Project (Landscape) and Cover Type (Mid-scale)
Landscape scale and mid-scale effects to snags are similar to those described under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same and the same number of acres would be treated. However effects to snags and logs differ between alternatives at the stand level.

Project (Landscape)
Under Alternative 3, both project areas would meet Forest Plan guidelines immediately after treatment. Large snags (greater than18 inches dbh) would fall slightly below standards in Mormon Mountain 20 years post-treatment. At 40 years post-treatment, snags would begin to decline slightly for both project areas.

Cover Type (Mid-scale)
Under Alternative 3, ponderosa pine post-treatment snags greater than 12 inches dbh meet Forest Plan standards in all cover types across the FWPP area however, snags greater than 18 inches dbh would continue to be below standards in the ponderosa pine, mixed conifer and aspen in the Dry Lake Hills area and the ponderosa pine in the Mormon Mountain area.

For aspen, the post-treatment density of snags would remain the same immediately after treatment and 20 years post treatment. Within 40 years there would be no aspen snags remaining.

None of the cover types currently meet the Forest Plan standard for snags or logs at the mid- scale level. There may be an additional loss of snags from burning; however, burning may also create new snags. Overall the project is designed to grow trees into larger size classes providing more recruitment snags over the long term.

Site/Stand (Small Scale)
Alternative 3 would impact snags on a site/stand level due to removal for safety reasons during helicopter operations and would not meet Forest Plan standards in some stands immediately after treatment. In the long-term (approximately 20- 40 years after treatment) snags would increase as trees would in time naturally convert to snags. Recruitment snags would be identified and retained from live trees that exhibit defects ideal for wildlife. No cable logging would occur under this alternative, which would reduce the need to remove the large trees and snags on steep slopes and also the need to create corridors. The areas proposed for harvest by helicopter logging would still need to have hazard trees removed. Alternative 3 would treat approximately 972 acres with helicopter logging with most snags cut for safety purposes. Design features have been incorporated

to provide for patches of snags up to 10 acres in size to serve as reserve areas within these units.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects

Project (Landscape) and Cover Type (Mid-scale)
On a landscape and mid-scale level, effects to snags would be similar to those discussed under Alternatives 2 and 3 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same. However Alternative 4 would treat approximately 3,136 fewer acres, having less incidental loss from implementation. Direct loss of snags would be less than the other action alternatives on a project level and in all cover types except ponderosa pine, where snag loss is slightly higher.

Site/Stand (Small Scale)
Under Alternative 4, there would be only incidental change in snag densities at the site/stand level. No cable logging or helicopter logging would occur under this alternative, which would reduce the need to remove snags on steep slopes and also the need to create corridors.

Alternative 4 would have the least impact to snags on a site/stand level.

Cumulative Effects for all Action Alternatives
The cumulative effects boundary is the FWPP project area. Past timber harvest and illegal fuelwood activities have reduced snag densities to below Forest Plan recommendations in some stands. Snags were removed during forest harvest because of potential fire and safety hazards, and many thought they had poor aesthetic value and were indicative of an unhealthy forest. Snags are especially vulnerable to bark beetle infestation, illegal fuelwood cutting, and ongoing projects that remove hazard trees such as APS hazard tree removal along powerlines and telephone lines.

The past outbreak of bark beetle infestations has killed trees thus creating snags, therefore increasing snags in pockets across the landscape. However, insect attacks result in rapid deterioration of snags, decreasing their longevity and value to wildlife. Some bug-killed trees would topple over and become downed logs. Bug killed logs would compensate for a portion of the loss of large logs due to burning activities.

Other fuels reduction and forest restoration project are designed to develop larger trees which provide recruitment for large snags. These projects would combine with FWPP to provide for snags in the long term across the landscape.

Wildlife Cover

Hiding and thermal cover are important forest attributes for wildlife habitat. Hiding cover is defined as in the Forest Plan as, "vegetation capable of hiding 90% of a standing deer or elk from human view at a distance of 200 feet or less." Tree trunks and foliage as well as shrubs and herbaceous vegetation offer hiding cover, as do topographic features, such as rock outcroppings and terrain breaks. Thermal cover is defined in the Forest Plan as, "a stand of coniferous trees tall enough to allow animal movement and bedding with a high degree of crown closure." Thermal cover offers protection from heat and cold. High tree crown closure also provides hiding cover from aerial predators (Forest Plan pg. 124). Combination cover includes stands that have both hiding and thermal cover qualities.

Existing Conditions
The Forest Plan requires 30 percent cover within Management Area 3 (ponderosa pine and mixed conifer on slopes less than 40 percent) and Management Area 4 (ponderosa pine and mixed conifer on slopes greater than 40 percent) in a 10K block outside the Urban Rural Influence Zone (URIZ) and Wildland Urban Interface 1U (FMAZ 1U). FWPP includes five 10K blocks: Elden, Fort Valley, Joys, Pine Grove and Wallace 10Ks. For this project, wildlife cover was analyzed on a stand by stand basis across Management Area 3 and Management Area 4 in each of the five 10K blocks. Key wildlife cover areas are steep slopes and drainages across the project. Oak is interspersed throughout the ponderosa pine and provides wildlife hiding cover. Generally the multi-storied structural character of mixed conifer provides wildlife a combination of thermal and hiding cover. Overall, existing wildlife cover percentages in all five 10K Blocks are greater than cover percentages required under Forest Plan direction.

The following evaluation criteria were used to compare environmental consequences for all alternatives:

- Amount of cover
- Type of cover (thermal, hiding, and combination)
- Location of cover

Analysis Methods
Wildlife Cover for FWPP was determined with the following information:

- Wildlife cover was documented at points along goshawk survey transects across most of the project area outside of PACs. Points were mapped at most 1000 foot intervals along transect that was at most 850 feet apart. Points were offset along neighboring transects by 500 feet. At each point, surveyors determined if there was hiding cover, thermal cover or a combination of both cover types.
- Orthophoto quadrants were overlaid with transect cover data to determine if points provided a good representation of the stand vegetative structure.
- Topographic maps were reviewed to determine if there were cover effects from topographic features and to determine if slopes are inoperable due to steep or rocky terrain.
- Field examinations were conducted to evaluate cover distribution needs and to determine whether other factors contributing to effective cover were present.

Assumptions made to determine cover remaining after treatments:

- Ponderosa pine and mixed conifer fuel reduction treatments would retain thermal and hiding cover values in 60 percent of the area. The remaining 40 percent could be in openings or groups of VSS 3 (9-12”dbh trees). Typically trees 9 to 12 inches in diameter are not large enough to provide thermal cover and basal area/canopy would be reduced to allow for tree growth thereby reducing wildlife hiding cover immediately after treatment. In the long-term seedlings and saplings would grow in openings and VSS 3 would develop into larger size classes with higher canopies to provide hiding and thermal cover.
- MSO PAC treatments would retain both hiding and thermal cover values in 80 percent of the area.
- Wet mixed conifer, MSO nest and recovery nest/roost treatments would retain cover values.
- Thin from below to 9 inch treatments would retain thermal cover values and remove

hiding cover values.

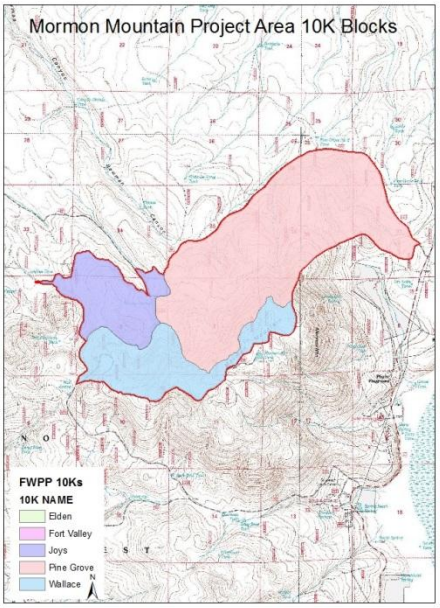
- Grassland restoration treatments would remove hiding and thermal cover values.
- Aspen restoration treatments would remove thermal cover and maintain hiding cover.
- Northern goshawk PFA fuels reduction treatments would retain hiding and thermal cover values in 70 percent of the area.
- Goshawk nest fuels reduction treatments would maintain hiding and thermal cover.
- Burn only stands would maintain thermal and hiding cover values.
- Stands would maintain hiding cover values where steep slopes are present and provide cover effects.
- Skyline corridors would reduce hiding and thermal cover within the 12-foot wide corridor (parallel corridors for the skyline need to be placed every 100 to 140 feet).
- Openings cut for developing VSS 1 and VSS 2 would not provide thermal or hiding cover immediately after treatment, although these areas would provide hiding cover approximately 20 years after treatment when seedlings and saplings begin to grow.

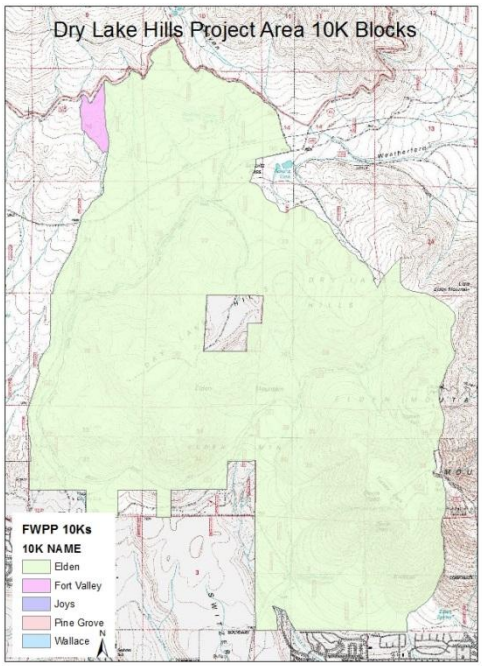
Table 26 summarizes the cover percentages by 10K block for the FWPP project. Figure 5 displays the 10K blocks by project area.

Table 26: Wildlife Cover Percentages of 10K Blocks within the Project Area

Measure of Change	Existing Conditions	Proposed Action	Alternative 3	Alternative 4	Forest Plan Direction
Percent Cover Elden 10K (7494 acres)	Hiding 4% Thermal .08% Combination 85% Total 90%	Hiding 2% Thermal 8% Combination 50% Total 60%	Hiding 2% Thermal 8% Combination 53% Total 63%	Hiding 3% Thermal 5% Combination 66% Total 74%	Hiding 10% Thermal 10% Combination 10% Total 30%
Percent Cover Fort Valley 10K (59 acres)	Hiding 0% Thermal 0% Combination 100% Total 100%	Hiding 0% Thermal 0% Combination 100% Total 100%	Hiding 0% Thermal 0% Combination 100% Total 100%	Hiding 0% Thermal 0% Combination 100% Total 100%	Hiding 10% Thermal 10% Combination 10% Total 30%
Percent Cover Joys 10K (455 acres)	Hiding 0 % Thermal 0% Combination 100% Total 100%	Hiding 0% Thermal 0% Combination 87% Total 87%	Hiding 0% Thermal 0% Combination 87% Total 87%	Hiding 0% Thermal 0% Combination 83% Total 83%	Hiding 10% Thermal 10% Combination 10% Total 30%
Percent Cover Pine Grove 10K (1889 acres)	Hiding 0% Thermal 0% Combination 100% Total 100%	Hiding 0% Thermal 0% Combination 72% Total 74%	Hiding 0% Thermal 0% Combination 74% Total 74%	Hiding 0% Thermal 0% Combination 75% Total 75%	Hiding 10% Thermal 10% Combination 10% Total 30%
Percent Cover Wallace 10K (631 acres)	Hiding 0% Thermal 0% Combination 100% Total 100%	Hiding 0% Thermal 0% Combination 83% Total 83%	Hiding 0% Thermal 0% Combination 83% Total 83%	Hiding 0% Thermal 0% Combination 83% Total 83%	Hiding 10% Thermal 10% Combination 10% Total 30%

Figure 5 – FWPP Project 10K Blocks within Mormon Mountain and Dry Lake Hills Project Areas





Alternative 1 – No Action Alternative

Direct and Indirect Effects
Under the No Action Alternative there would be no change from existing conditions. Current conditions exceed Forest Plan direction. A surplus of thermal and hiding cover for wildlife would be maintained across the project area. However, as dense forest conditions would still occur, the high fire hazard would continue to place wildlife cover at risk with respect to stand-replacing fire.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to wildlife cover within the project and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place wildlife cover at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Horizontal and vertical diversity are both important components of cover. Alternative 2 would maintain hiding cover at least 200 feet wide around dependable waters (Schultz Tank, Pushout Tank and Weimer Spring) and within MSO protected and recovery nest/roost habitats and northern goshawk nest stands. These areas provide cover for big game species as well as attributes for resident songbirds, raptors, turkey and other wildlife. Alternative 2 would still provide cover and vertical diversity for most species and would meet Forest Plan direction.

This alternative would reduce thermal and hiding cover across in all 10K blocks except Ft. Valley 10K. There would be an additional 3 percent (196 acres) loss of a combination of thermal and hiding cover from the creation of cable corridors in Elden10K and 2 percent (45 acres) loss of a combination of thermal and hiding cover in the Pine Grove 10K.This reduction would still provide adequate cover for most species and exceed Forest Plan direction.

Cumulative Effects
The cumulative effects boundary is the project area. Roads and trails within and adjacent to cover sites provide access to recreation activities, thereby reducing effectiveness of that cover for some species due to human disturbance. The Travel Management Rule (TMR) analysis was completed for the Forest (Sept. 2011) and identified a desired road system; post-TMR projects evaluate closure/decommissioning of roads not on that identified system, and would get rid of un-needed roads. The FWPP is such a project, and the existing road system is expected to change as a result with fewer miles of road ultimately existing in order to attain a manageable and sustainable road system. With the implementation of similar adjacent projects, such as 4FRI, the road density is anticipated to continue to decrease, thereby cumulatively improving the effectiveness and quality of cover across the district.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects
Effects to cover would be similar to those described under Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same. No cable logging would occur under this alternative, which would reduce the need to remove the large trees and

snags on steep slopes and also the need to create corridors, though this alternative would still require hazard (snag) tree removal in areas proposed for helicopter logging. Alternative 3 would provide more cover than Alternative 2 due to the lack of cable corridors.

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to cover would be similar to those of Alternatives 2 and 3 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be less area where cover attributes were reduced. No cable logging or helicopter logging would occur under this alternative, which would reduce the need to remove large trees and snags on steep slopes and also the need to create corridors. Also approximately 3,135 fewer acres would be treated, resulting in the same continued high vegetative density in those untreated acres as in the No Action Alternative. This alternative maintains the most cover of the action alternatives in Elden and Pine Grove 10Ks, the same amount of cover in Ft. Valley and Wallace10Ks and less in Joys 10K.

Cumulative Effects
Cumulative effects are the same as Alternative 3, but to a lesser degree as fewer acres would be treated. .

Management Indicator Species

The working draft Forest-wide assessment *Management Indicator Species Status Report for the Coconino National Forest* (USDA 2013) summarizes current knowledge of population and habitat trends for species identified as MIS for the Coconino National Forest. Arizona Game and Fish Department provides annual population trend updates by Game Management Unit (GMU) for game species (i.e. elk, turkey, mule deer, and pronghorn). This information when available is used to augment the MIS report. Below are descriptions of each of the management indicator species identified for management areas (MAs) within the analysis area, and a discussion of the relationship of the effects of each project alternative on forest-level population and habitat trends for each of these species.

Management indicator species (MIS) for this project are evaluated based on management area types located within the project area. The MAs listed in the following table, with associated indicator species, and are indicated to be present within the project boundary. MIS species excluded from analysis due to lack of indicator habitats or features are listed here but not included in the analysis. These species include juniper (plain) titmouse, cinnamon teal, Lucy's warbler, yellow-breasted chat, and macroinvertebrates. These are a subset of the forest-wide management areas and management indicator species. Refer to the Forest Plan for a complete list of management areas and associated management indicator species. Table 25 describes MIS and the habitat components they are indicators for.

Analysis Methods
The following evaluation criteria were used for MIS to compare environmental consequences for alternatives:

- Indicator Habitat Quantity
- Indicator Habitat Quality

Appendix C summarizes acres of activity by cover type for the action alternatives. MSO protected habitat treatments may include both mixed conifer and ponderosa pine cover types.

Determination of MIS to Analyze

Determination of MIS to analyze for this project was based on MA types located within the project area. Table 27 lists the MAs present within the project area and the MIS associated with each MA, as specified in the COF LMP. The species listed in Table 28 are the species that are not analyzed further in this document.

Table 27 MAs within the FWPP with the Associated MIS

MANAGEMENT AREA (MA)	MANAGEMENT INDICATOR SPECIES	ACRES WITHIN DLH AREA ON FS LANDS	ACRES WITHIN MORMTN AREA ON FS LANDS	TOTAL ACRES WITHIN FWPP ON FS LANDS
MA 3 -Ponderosa Pine and Mixed Conifer <40% Slopes	Abert squirrel, red squirrel, Mexican spotted owl, elk, northern goshawk, pygmy nuthatch, turkey, and hairy woodpecker	2890	2619	5509
MA 4 -Ponderosa Pine and Mixed Conifer >40% Slopes	Abert squirrel, red squirrel, Mexican spotted owl, elk, northern goshawk, pygmy nuthatch, turkey, and hairy woodpecker	3389	345	3734
MA 5 - Aspen	Red-naped sapsucker, mule deer	89	2.0	91
MA 6 – Unproductive Timber Land	Elk, mule deer, Abert squirrel and hairy woodpecker	672	N/A	672
MA 8 -Pinyon-Juniper Woodland >40% Slopes	Juniper (plain) titmouse, mule deer and elk	15	N/A	15
MA 9 – Mountain Grassland	Elk, pronghorn antelope	46	N/A	46
MA10-Grassland and Sparse Pinyon-Juniper Above the Rim	Pronghorn antelope	140	N/A	140
MA 15 – Developed Recreation Site	N/A	N/A	9	9
MA18 – Elden Environmental Study Area	N/A	268	N/A	268
Electric	N/A	20	N/A	20

MANAGEMENT AREA (MA)	MANAGEMENT INDICATOR SPECIES	ACRES WITHIN DLH AREA ON FS LANDS	ACRES WITHIN MORMTN AREA ON FS LANDS	TOTAL ACRES WITHIN FWPP ON FS LANDS
PVT.	N/A	40	N/A	40

Forest habitat acreage for MAs provided by FSVeg/RMRIS stand database. These acres may vary slightly from the Vegetation Section, which identifies acres of cover types.

Table 28: MIS Considered but Eliminated from Detailed Analysis

MIS	Indicator Habitat	Rationale for Excluding
Cinnamon teal	Wetlands, aquatic	Indicator habitat not present nor does potential exist for indicator habitat
Lincoln's sparrow	Late seral, high elevation riparian	Indicator habitat not present nor does potential exist for indicator habitat to occur in large enough areas to support this species
Lucy's warbler	Late seral, low elevation riparian	Project area would not support necessary habitat for this species (desert shrub, mesquite, desert trees)
Macro-invertebrates	Late seral high and low elevation riparian	Indicators for lotic streams, which are not present nor is there potential within the project area
Yellow-breasted chat	Late seral, low elevation riparian	Indicator habitat not present, nor does potential exist for indicator habitat
Juniper Titmouse	Pinyon-juniper	There are 15 acres of indicator habitat in the Dry Lake Hills project area. These acres would not be treated and no activities would occur within these habitats for all action alternatives.

Existing Conditions for MIS

Forest-wide Population and Habitat Trends

The working draft Forest-wide assessment *Management Indicator Species Status Report for the Coconino National Forest* (USDA 2013) was used to summarize current knowledge of forest-wide population trends and forest-wide habitat trends for species identified as management indicator species (MIS) for the COF.

Table 26 lists the MIS considered in the FWPP analysis and a summary of their forest-wide population trend, as described in USDA (2013) or reported by AGFD. Habitat requirements and forest-wide habitat trend as reported in USDA (2013) are summarized in Table 29 for each MIS analyzed in this report, and a summary of the findings of the forest-wide habitat trend for the species is also included. For a detailed description of the forest-wide population trend, species account, habitat requirements, and forest-wide habitat trends for each MIS, refer to USDA (2013), a copy of which is filed in the project record.

During northern goshawk surveys completed in 2013, all observations of MIS at each of the 824 call points were noted. Number of call points where MIS individuals or signs thereof were observed is reported in Table 29.

Table 29 MIS and Forestwide Population Trend, Important Habitat Components, and Forestwide Component Trends

MIS	Forest Population Trend	Indicator Habitats[1]	Habitat Component Trend	Acreage in Project Area	Forestwide Acreage (PNVT Acres)	# Call Points where Observed
Abert's Squirrel	Stable	Early seral PIPO	Increasing	6259[2]	807,424	28
Elk	Stable to Increasing	Early seral PIPO	Increasing	6259[2]	807,424	5
		Early seral MC	Increasing	0	79,060	
		Early seral S-F	Increasing	0	13,942	
Hairy woodpecker	Slightly Increasing	Snag component of PIPO	Increasing	6259[2]	807,424	19
		Snag component of MC	Inconclusive	4158	79,060	
		Snag component of S-F	Inconclusive	0	13,942	
Mexican spotted owl	Stable to Declining	Late seral MC	Increasing	4158	79,060	0
		Late seral S-F	Increasing	0	13,942	
Red-naped Sapsucker	Declining	Early seral aspen	Declining	0	3,450	0
Mule deer	Declining	Early seral aspen	Declining	0	3,450	20
		Early seral P-J	Increasing	0	601,829	
Northern goshawk	Stable to Declining	Late seral PIPO	Increasing	6259[2]	807,424	0
Pronghorn	Stable	Early and late seral Grassland	Stable to declining	60	266,049	0
Pygmy Nuthatch	Stable to Declining	Late seral PIPO	Declining	6259[2]	807,424	46
Red Squirrel	Stable	Late seral MC	Increasing	4158	79,060	28
		Late seral S-F	Increasing	0	13,942	
Turkey	Stable	Late seral PIPO	Increasing	6259[2]	807,424	1

Notes:
1 MC = Mixed Conifer, PIPO = Ponderosa Pine, P-J = Pinyon-Juniper, S-F = Spruce-Fir
2 Total acres of ponderosa pine in the project area

Table 30 summarizes the total acres of habitat being treated by alternative for each MIS. Table 31summarizes the acres of habitat that would be changed for each MIS from the creation of cable corridors resulting in an indicator habitat type conversion and Table 32 summarizes acres treated by cable or helicopter logging resulting in a loss of snags and/or large trees changing the habitat quality for species with snags and/or late seral as an indicator habitat.

Table 30 MIS Habitat Treated by Alternative (Acres/% of Forest-wide habitat)

MIS Species	Current Forest-wide Habitat	No Action	Alt. 2	Alt.3	Alt. 4
Abert Squirrel	490,000	0	4865/0.9	4865/0.9	3846/0.7
Red Squirrel	42,000	0	3986/9.5	3986/9.0	1896/5.0
Mexican Spotted Owl	42,000	0	3986/9.5	3,986/9.0	1896/5.0
Northern Goshawk	193,812	0	4865/3.0	4865/3.0	3846/2.0
Pygmy Nuthatch	193,812	0	4865/3.0	4865/3.0	3846/2.0
Turkey	193,812	0	4865/3.0	4865/.3.0	3846/2.0

MIS Species	Current Forest-wide	No Action	Alt. 2	Alt.3	Alt. 4
Elk	22,188	Pipo-0 MC- 0	Pipo-4865/21 MC-3986/18	Pipo-4865/21 MC-3986/18	Pipo-3846/17 MC-1896/9.0
Hairy Woodpecker	231,812	Pipo-0 MC -0	Pipo-4865/2.1 MC-3986/1.7	Pipo 4865/2.1 MC 3986/1.7	Pipo-3846/1.7 MC-1896/0.8
Red-naped Sapsucker	3,450**	0	22/0.6	22/1.0	2/.05
Mule Deer	3,450**	0	22/0.6	22/1.0	2/.05
Antelope	161,000	0	60/.04	60/.04	53/.03

** Undetermined in MIS report. Forest Plan identifies 3,450. Much of the aspen is found is the mixed conifer cover type.

Table 31: Effects to MIS indicator habitat quantity by alternative (Acres/% of Forest-wide habitat)

MIS Species	Current Forest-wide Habitat	No Action	Alt. 2	Alt.3	Alt. 4
Abert Squirrel	490,000	0	+63/+.01	-0/.0	-0/0
Red Squirrel	42,000	0	-178/-.0.4	-0/.0	-0/0
Mexican Spotted Owl	42,000	0	-178/-0.4	-0/.0	-0/0
Northern Goshawk	193,812	0	-63/-.03	-0/.0	-0/0
Pygmy Nuthatch	193,812	0	-63/-03	-0/0	-0/0
Turkey	193,812	0	-63/-03	-0/.0	-0/0
Elk	22,188	Pipo 0 MC 0	Pipo+63/+0.3 MC+178/+0.3	Pipo 0/0 MC 0/0	Pipo 0/0 MC 0/0
Hairy Woodpecker	231,812	Pipo 0 MC -0	Pipo -378/-0.2 MC -912/-0.4	Pipo-296/-0.1 MC-676/-0.3	Pipo 0/0 MC 0/0
Red-naped Sapsucker	3,450*	0	0/0	0/0	0/0
Mule Deer	3,450*	0	0/0	0/0	0/0
Antelope	161,000	0	0/0	0/0	0/0

** Undetermined in MIS report. Forest Plan identifies 3,450. Much of the aspen is found is the mixed conifer cover type

Table 32: Effects to MIS habitat quality by alternative (Acres/% of Forest-wide habitat)

MIS Species	Current Forest-wide Habitat	No Action	Alt. 2	Alt.3	Alt. 4
Abert Squirrel	490,000	0	+63/+.01	0/0	-0/0
Red Squirrel	42,000	0	-912/-2.2	-676/-1.6	-0/0
Mexican Spotted Owl	42,000	0	-912/-2.2	-676/-1.6	-0/0
Northern Goshawk	193,812	0	-378/-0.2	-296/-0.2	-0/0
Pygmy Nuthatch	193,812	0	-378/-.0.2	-296/-.0.2	-0/0
Turkey	193,812	0	-378/-0.2	-296/-0.2	-0/0
Elk	22,188	Pipo 0 MC 0	Pipo+63/+.01 MC+178/+0.8	Pipo 0/0 MC 0/0	Pipo 0/0 MC 0/0
Hairy Woodpecker	231,812	Pipo 0 MC 0	Pipo-378/-0.2 MC -912/-0.4	Pipo-296/-.01 MC-676/-.01	Pipo 0/0 MC 0/0
Red-naped Sapsucker	3,450*	0	0/0	0/0	0/0
Mule Deer	3,450*	0	0/0	0/0	0/0
Antelope	161,000	0	+9/ +<.01	+9/+<.01	+9/+<.01

** Undetermined in MIS report. Forest Plan identifies 3,450. Much of the aspen is found is the mixed conifer cover type.

Abert Squirrel

The Forest Plan designates the Abert squirrel as a management indicator species for early seral stage ponderosa pine forests. However, Abert squirrels use a variety of age classes and research from several locations has shown strong habitat associations with mature ponderosa pine. Research indicates that this species' best habitat is the intermediate to older-aged forest (trees 9-22 inches dbh), where groups of trees have crowns that are interlocking or in close proximity (Dodd et al. 1998). Squirrels favor scattered large trees and multi-storied stands mixed with poles. Abert squirrels select and use broomed[3] ponderosa pine trees (Garnett 2004). The project area currently exhibits good quality habitat for Abert squirrel.

Existing Conditions

Population trend. The forest-wide population trend is inconclusive since there is little forest-specific data. Statewide information indicates a stable trend for hunter harvest of squirrels. Abert squirrels are currently found throughout the ponderosa pine in the project area. Abert squirrel nesting habitat includes high canopy cover with interlocking canopies, multi-storied structure, high basal area with 18 inch dbh trees distributed throughout.

Habitat trend, early seral stage ponderosa pine. Forest-wide trend is slightly increasing. Although the age class distribution is shifting slightly, the proportion of the forest in un-even-aged conditions has stayed about the same.

Alternative 1 – No Action

Direct and Indirect Effects

Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect on Abert squirrel forest-wide habitat or population trends. However, dense forest conditions would still occur and the high fire hazard potential would continue to place squirrel habitat at risk with respect to stand replacing fire, resulting in an indirect adverse effect. The project area would continue to be lacking in the higher basal areas made up of large trees that provide high quality nesting habitat. Foraging habitat would continue to be limited as large tree basal areas would remain lower and densities higher reducing tree growth rates and limiting cone production.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to squirrel population or habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Under Alterative 2, the best quality nesting habitat would be reduced to lower quality nesting habitat. Mid-seral stage ponderosa pine habitat would be reduced as trees grow into larger size

[3] Dwarf-mistletoe infections which are profusely branched, dense masses of distorted host trees branches in the crowns of infected trees.

classes. Group sizes would vary across the landscape, with groups up to 0.7 acres in size with crowns that have interlocking canopies. Trees would grow into the larger diameter class at a faster rate than under the No Action Alternative. Although mid-seral habitat quality would be reduced, this action alternative would continue to provide recruitment, nesting and foraging habitat for Abert squirrels in the project area. There would be a complete loss of indicator habitat on approximately 63 acres where cable corridors would be created. This reduction in habitat quality is too small to alter the Forest-wide habitat or population trends.

Cumulative Effects
There would be no alteration to forest-wide habitat or population trends from Alternative 2. Past fuel reduction treatments have reduced habitat quality due to lower tree densities and lack of interlocking crowns; however, MSO protected habitat and northern goshawk PFAs have similar habitat qualities as those required for higher quality Abert squirrel habitat and densities. These protected habitats are scattered across the landscape and provide habitat for squirrels. Past fuel treatments have maintained large trees across the landscape and are reducing competition between trees for water and nutrients thereby moving toward the larger VSS size classes, which are important for Abert squirrels.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to Abert squirrel habitat would be similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same. There would be no cable corridors created in this alternative with no additional loss of habitat. This alternative may have a slight change to mid-seral ponderosa pine; however, this reduction in habitat quality is too small to alter the Forest-wide habitat or population trends.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Alternative 4 would treat 3,846 acres of ponderosa pine with a fuels reduction treatment. This alternative would treat the fewest acres of Abert squirrel habitat compared to the other action alternatives. This alternative may have a slight change to mid-seral ponderosa pine; however this reduction in habitat quality is too small to alter the Forest-wide habitat or population trends.

Red Squirrel

The Forest Plan designates the red squirrel as an indicator for late-seral mixed conifer and spruce-fir habitat. Red squirrels are found in Arizona where spruce, spruce with Douglas- fir or white-fir with Douglas-fir occur at elevations above 7,500 feet. Red squirrel nests are often in tree cavities. Preferred mean diameters are 14 inches. Red squirrels have also been documented to use dwarf mistletoe for nests (Hedwall 2006, Vahle 1968). Red squirrels must store and maintain a winter food supply in centralized caches. Large standing snags and large down logs are important for caches. Most caches are centered within a group of trees containing at least one or more large dominant conifers. Hedwall (2006) documented red squirrel use of dwarf mistletoe for foraging and caching. Red squirrels need adequate food supply, protective cover, moisture and shade for cone storage (Vahle and Patton 1983). Red squirrels were documented to occur in both the Dry Lake Hills and Mormon Mountain project areas. Red squirrel and their caches were documented and caches were mapped in areas surveyed for northern goshawks.

Existing Conditions
Population trend. Forest-wide population trend is assumed to be stable given the relatively stable

state-wide trend in tree squirrel harvest. The Heritage rating in Arizona is S5, indicating a secure population in the state. As with the Abert's squirrel, very little population data is available for this species Forest-wide or for larger regions. The relationship of active primary caches during the fall and winter can be used to determine squirrel populations (Vahle and Patton 1983). No population estimates have been made on the Coconino National Forest.

Habitat trend, late seral mixed conifer and spruce-fir. Forest-wide trend is slightly increasing. Forest structure is moving toward more un-even-aged conditions.

Alternative 1 – No Action Alternative

Direct and Indirect Effects

Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect on red squirrel forest-wide habitat or population trends. However, dense forest conditions would still occur and the high fire hazard potential would continue to place squirrel habitat at risk with respect to stand replacing fire, resulting in an indirect adverse effect. Foraging habitat would continue to be limited as tree basal areas would remain lower and densities higher reducing tree growth rates and limiting cone production.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to squirrel population or habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Under Alternative 2, mixed conifer fuels reduction would reduce overall stand densities, which would result in greater tree vigor and increased resistance to insect and disease. With the exception of openings, treatments will increase the late-seral component of the mixed conifer. This would create better quality habitat, resulting in an indirect beneficial effect. There would be a loss of approximately 178 acres of indicator habitat from the creation of cable corridors. Areas treated with cable logging would require the removal of snags in an additional 734 acres of red squirrel indicator habitat, reducing habitat quality. Biologist would coordinate patch placement with existing red squirrel caches however; some caches would have snags removed. With the exception of cable corridors and areas harvested by cable logging, a minimum of one cache per two acres would be identified and all trees would be retained within a 26-foot radius. Additional caches would be protected outside of cable logging units to compensate for the reduced quality within the cable logged units (see Design Features). Although there would be a loss of indicator habitat with reduced quality in a small percentage of habitat, this reduction is too small to alter the forest-wide habitat or population trend for red squirrels. Treatments proposed for this project would provide protection from stand- replacing crown fires to squirrel habitat within the project area.

Changes in red squirrel occupancy would be monitored under all alternatives. Rocky Mountain Bird Observatory (RMBO) will be conducting pretreatment monitoring the summer of 2014 and in addition to songbirds surveyors will be collecting red squirrel occupancy data across the project

area. This and subsequent post-treatment data of project area changes in densities can be compared to our ongoing Forestwide survey densities to help determine if changes are treatment related or at a larger scale. Another potential monitoring plan includes monitoring to establish long-term trends in populations and habitat use and the effects of forest restoration on red squirrels. A proposal from Arizona Game and Fish Department is described in Appendix F.

Cumulative Effects
The cumulative effects boundary for red squirrel is the project area. There would be no alteration to forest-wide habitat or population trends and there would be no cumulative effect from past, present or foreseeable projects. Past fuel reduction treatments included very few acres of treatments in mixed conifer habitat. Wilderness, MSO protected habitat and northern goshawk PFAs have similar habitat qualities as those required for higher quality red squirrel habitat and densities. These protected habitats are scattered across the landscape thereby providing habitat for squirrels.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to red squirrel habitat would be similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistently random due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. There would be no loss of indicator habitat from cable corridors; however, habitat quality would be reduced on approximately 676 acres of indicator habitat proposed for helicopter logging from the removal of snags for safety. This reduction of snags could reduce potential nest structures for red squirrels and reduce the quality of cache sites. Biologist would consider caches when identifying patches of snags to be maintained reducing the potential elimination of nest sites in these areas. This reduction in habitat quality is too small to alter the forest-wide habitat or population trends.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to indicator habitat would similar to those described for Alternatives 2 and 3; however there would be no increased loss of habitat quality from snag removal as there would be no cable or helicopter logging in this alternative. This alternative treats the least acres in mixed conifer habitats. Under Alternative 4, the wet mixed conifer belt and MSO nest cores would not be treated in the Mormon Mountain area, with a total of 1,896 acres treated in mixed conifer, 2,090 acres less than Alternative 2 and 3. This reduction in treatment acres would reduce the number of caches that could be impacted by project implementation; however there would be 2,090 less acres where large trees and recruitment snags would be developed into the future reducing long term sustainable of indicator habitat.

Mexican Spotted Owl

The Forest Plan designates the Mexican spotted owl (MSO) as an indicator for late-seral mixed conifer and spruce-fir habitat. Along with several other species, management of spotted owls and their habitat is emphasized in Management Area 3, ponderosa pine and mixed conifer less than 40 percent slope, and Management Area 4, ponderosa pine and mixed conifer greater than 40 percent slope. Important attributes used by MSO include cool microclimates, multistoried, multi-species stands with high canopy cover, large number of snags, high basal area, rocky outcrops and/or cliffs, and small openings. Seamens and Gutierrez (1999) reported that 61

percent of MSO nests in their study site were on masses of limbs distorted by mistletoe in Douglas fir.

Existing Conditions
Population trend. Overall, the forest-wide population trend is not known for certain, but may be stable to declining. A few new PACs are still being found on the Forest, and occupancy rates are up and down. The only demography study done on the Coconino National Forest indicated a declining trend, but the study did not span a sufficient time period to make long-term population trend estimates, and climatic factors are thought to play a significant role in influencing survival and reproduction of owls (Seamans 2002).

Habitat trend, late seral mixed conifer and spruce-fir. Forest-wide trend is slightly increasing. These forest types are moving toward a more even-aged structure.

Alternative 1 – No Action Alternative
Direct and Indirect Effects
Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect on MSO forest-wide habitat or population trends. However, dense forest conditions would still occur and the high fire hazard potential would continue to place owl habitat at risk with respect to stand replacing fire, resulting in an indirect adverse effect. For additional information about impacts to MSO, see analysis in TES section above.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to MSO population or habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Under Alternative 2, there are approximately 3,986 acres that are proposed for treatment in mixed conifer. Uneven-aged management would reduce overall stand densities which would result in greater tree vigor and increased resistance to insect and disease. Prescribed burns would be of low intensity. Vegetation treatments would create openings for development of VSS 1 and VSS 2 reducing late-seral habitat by 20 percent within treated areas. With the exception of cable corridors, there would not be a noticeable difference in the number of 18 inch dbh trees across the landscape. This alternative would remove late seral indicator habitat on 178 acres from the creation of cable corridors. There would be an additional reduction of habitat quality for 912 acres harvested by cable logging, where snags would be cut for safety purposes. This loss of habitat and reduction of habitat quality is too small to alter the Forest-wide habitat or population trends. Alternative 2 would provide protection from stand-replacing crown fires to remaining MSO habitat within the project area.

Cumulative Effects
There would be no effect to forest-wide habitat or population trends and there would be no cumulative effect from past, present or foreseeable projects. Past fuel reduction treatments have

included very few acres of treatments in mixed conifer habitat.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to MSO habitat would similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be no reduction of habitat quantity due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. Helicopter logging would require additional removal of snags for safety in 676 acres reducing habitat quality. This loss is too small to alter the Forest-wide habitat or population trend for MSO.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to indicator habitat would similar to Alternatives 2 and 3; however there would be less acres treated in mixed conifer habitats. Under Alternative 4, the wet mixed conifer belt and MSO nest cores on Mormon Mountain would not be treated; however treatments would occur above and below that belt, and treatments would still occur within the Schultz nest core and PAC and a portion of the Elden PAC in the Dry Lake Hills Alternative 4 would treat 1,896 acres in mixed conifer, 2090 acres less than Alternatives 2 and 3. This reduction in treatment acres would reduce the area treated to develop into old growth.

Northern Goshawk

The Forest Plan designates this species a MIS for late seral stages of ponderosa pine forests. Goshawks are relatively abundant and widespread, and although population trends are difficult to determine, there is no hard evidence of a considerable decline overall, but populations could be declining in some areas (NatureServe 2013). On the Coconino National Forest, northern goshawk territories have been monitored every year since 1989, with an average of 43 territories monitored from 1991 to 2001. The occupancy rate of territories has declined over these last 11 years; however, this does not signify a corresponding trend in population numbers. It is likely that nonbreeding goshawks would not be observed. During the later years of this time period, precipitation amounts have been below average. Climate may very well play an important role in whether or not northern goshawks breed in a given year, and would also influence nesting success of northern goshawks. Although the Forest has some information on territory occupancy and reproduction, these data are not designed to detect changes in population trend. Total number of territories has increased and the statewide Breeding Bird Survey (BBS) data indicates a significant increase, but some indicators of occupancy and productivity appear to be declining on the forest; however year-to-year variability is high.

Existing Conditions
Population trend. The forest-wide trend is stable to declining. Although the Forest has some information on territory occupancy and reproduction, these data are not designed to detect changes in population trend. The total number of territories has increased, and state-wide BBS data indicate a significant increase, but some indicators of occupancy and productivity appear to be declining on the Forest. Monitoring and surveys are ongoing on the forest. There are three post-fledgling family areas (PFA) delineated within the FWPP.

Habitat trend. Late seral –stage ponderosa pine. The Forest-wide habitat trend for late-seral

ponderosa pine is increasing slightly. Although the age class distribution of ponderosa pine is shifting slightly, the proportion of the forest in uneven-ages conditions has stayed about the same.

Alternative 1 – No Action Alternative

Direct and Indirect Effects

Indicator habitat conditions for goshawks would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect to forest-wide habitat or population trends for northern goshawk. However, dense forest conditions would still occur and the high fire potential would continue to place goshawk habitat at risk with respect to stand replacing fire, resulting in an indirect adverse effect to habitat. The desired conditions for sustaining and developing lat- seral ponderosa pine habitat would never be attained. For additional information about impacts to northern goshawks, see analysis in TES section above.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to goshawk population or habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2 - Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Under Alternative 2, the quantity and quality of late-seral (VSS 5 and 6) goshawk indicator habitat would increase, resulting in a direct beneficial effect to habitat Under Alternative 2, trees would grow into the larger diameter classes at a faster rate than compared to the No Action Alternative. This alternative would increase late-seral stage habitat and would offer higher quality nesting habitat over time due to the increase in the acres of VSS 5 and 6 stands, resulting in a direct beneficial effect to habitat. Management of old growth, MSO habitat and northern goshawk PFAs under Alternative 2 would provide habitat for the northern goshawk. This alternative is expected to have no effect to the forest-wide population trends for the northern goshawk. The increase in development in late-seral stage habitat is beneficial, but the amount of change is not enough to change forest-wide habitat or population trend.

There would be a complete loss of indicator habitat on 63 acres where cable corridors would be created. There would be an additional loss of habitat quality for 378 acres harvested by cable logging due to the removal of snags for safety purposes. This reduction in habitat quantity and quality is too small to alter the forest-wide habitat or population trends.

Cumulative Effects

There are additional indirect effects from vegetation modification activities occurring in other projects, including hazard tree removal for powerlines and highways, as well as tree removal for development of state and private lands. Generally, projects on the National Forest are designed to move toward the desired conditions for northern goshawks as identified in the Forest Plan. Cumulatively, these projects combined with the effects from Alternative 2 would have no effect to the forest-wide population or habitat trend for the northern goshawk.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to northern goshawk indicator habitat would be similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be no additional loss of habitat quantity due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. Helicopter logging on 296 acres of indicator habitat would require the removal of snags for safety purposes reducing habitat quality. This reduction in habitat quality or quantity is too small to alter the Forest-wide habitat or population trends.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to northern goshawk habitat would be similar to Alternatives 3 and 4; however, there would be fewer acres treated in ponderosa pine indicator habitat. Under Alternative 4, there would be no additional loss of habitat quantity from cable corridors or reduced quality from loss of snags as no areas would be harvest by cable or helicopter logging. Alternative 4 would treat 3,846 acres in ponderosa pine, 1,019 less than Alternatives 2 and 3, reducing the acres that would develop into old growth. This alternative would not reduce habitat quality or quantity enough to change the forest-wide habitat or population trends.

Pygmy Nuthatch

The Forest Plan designates the pygmy nuthatch a MIS for late-seral stage ponderosa pine forests. The pygmy nuthatch is generally associated with mature ponderosa pine forests, where it prefers open, park-like stands of old, yellow pines. It is also found in dense pine forests, as long as large trees and snags are present. The pygmy nuthatch is also tied to old, large oak trees and cavities. This nuthatch requires dead trees or dead-top trees where it builds nests in cavities. Both in Arizona and North America, moderate threats exist on breeding and wintering grounds. Populations are thought to be stable to slightly declining on the Coconino National Forest, and secure state-wide.

Existing Conditions
Population trend. The forest-wide trend is stable to declining. Globally, nationally, and for Arizona, populations are considered to be secure. Pygmy nuthatches have been observed throughout the project area.

Habitat trend; late seral stage ponderosa pine. Forest-wide, the trend is increasing slightly. Although the age class distribution is slightly shifting, the proportion of the forest in uneven-aged conditions has stayed the same. Overall, snags are thought to be increasing in the ponderosa pine and would continue to increase and densities of large snags would increase (Ganey and Vojta).

Alternative 1 – No Action Alternative

Direct and Indirect Effects
Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect on pygmy nuthatches. However,

dense forest conditions would still occur and the high fire hazard potential would persist, resulting in an indirect adverse impact.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to pygmy nuthatch population or habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate.

The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2- Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Under Alternative 2, trees would grow into the larger diameter classes at a faster rate than compared to the No Action Alternative. This alternative would increase late-seral stage habitat and would offer higher quality nesting habitat over time due to the increase in the acres of VSS 5 and 6 stands, resulting in a direct beneficial effect to habitat. Management of old growth, MSO habitat and northern goshawk PFAs under Alternative 2 would provide habitat for the pygmy nuthatch.

There would be a complete loss of indicator habitat on 63 acres where cable corridors would be created. There would be an additional loss of habitat quality for 378 acres harvested by cable logging due to the removal of snags for safety purposes. This reduction in habitat quantity and quality is too small to alter the Forest-wide habitat or population trends.

Cumulative Effects
There are additional cumulative effects from vegetation modification activities occurring in other projects, including hazard tree removal for powerlines and highways, as well as tree removal for development of state and private lands. Generally, projects on the National Forest are designed to move toward the desired conditions for pygmy nuthatch. Cumulatively, these projects combined with Alternative 2 would have no effect to the forest-wide population or habitat trend for the pygmy nuthatch.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to pygmy nuthatch indicator habitat would be similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be no additional loss of habitat quantity due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. Helicopter logging on 378 acres of indicator habitat would require the removal of snags for safety purposes reducing habitat quality. This loss of habitat quality would be too small to alter the forest-wide habitat or population trends.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to pygmy nuthatch habitat would be similar to Alternatives 3 and 4; however, there would

be fewer acres treated in ponderosa pine indicator habitat. Under Alternative 4, there would be no additional loss of habitat quantity from cable corridors or reduced quality from loss of snags as no areas would be harvested by cable or helicopter logging. Alternative 4 would treat approximately 3,846 acres in ponderosa pine, 1,019 less than Alternatives 2 and 3, reducing the acres of indicator habitat that would be treated to develop into larger size classes. This alternative would not reduce habitat quality or quantity enough to change the forest-wide habitat or population trends.

Turkey

The Forest Plan designates turkey as a MIS for late seral stage ponderosa pine forests, based on roost habitat requirements. Key habitat attributes for turkeys include: availability of roost trees in summer and winter range which consist of groups of large yellow pines; uneven-aged overstory structure; nesting areas; mast from ponderosa pine, pinyon pine, juniper, and oak; riparian areas around springs and seeps; and small openings for seed head and invertebrate production. Mast production is vital to how well turkeys over-winter and it is tied to the amount and timing of precipitation.

Although the age class distribution of ponderosa pine has remained dominated by mid-seral stage stands, there had been some loss of old growth and older trees, resulting in a decline in forest-wide habitat trend for late-seral ponderosa pine habitat. Turkey roosts and nesting habitat occur in steep drainages and on hills. Turkey populations on the Forest declined in the early 1990s but have increased since the mid-1990s in probable response to favorable overwintering conditions, changes in hunt design in the GMU, and contributions to overall mast production from trees from the 1919 seed year. The age class distribution of ponderosa pine has remained the same during Forest Plan implementation. Late-seral stage trees have remained largely unchanged on slopes greater than 40 percent. The loss of large old trees occurred on slopes less than 40 percent during the early stages of Forest Plan implementation. The rate of loss due to timber harvest is now much reduced and harvest of trees over 24 inches dbh rarely occurs. Other factors affecting turkey populations are lack of cover in key areas (including travel corridors), water availability, and forage availability are important factors (USDA 2002).

Existing Conditions

Population trend. The forest-wide trend is increasing. The trend was variable in the early part of the Forest Plan implementation period (late ‘80s and early ‘90s), although AZGFD standard survey procedures did not provide good data due to low number of observations along survey routes. AZGFD developed a better index of turkey populations in the mid1990s. Data from 1997-2001 indicate a modestly increasing trend. For the last five years, Game Management Unit (GMU) 7 shows a relatively stable trend, with all other GMUs showing a general increasing trend for both percent of archery elk hunters seeing turkeys and the number of turkeys seen per day (USDA Forest Service 2002).

Habitat trend; late-seral ponderosa pine. The age class distribution of ponderosa pine has remained essentially the same, dominated by mid-seral stage stands, with some loss of old-growth and older trees, and some early-seral stage habitat created by wildfire. The project area provides both roosting and nesting habitat for turkey. Turkey was documented at one call point within the project area.

Alternative 1 – No Action Alternative

Direct and Indirect Effects

Habitat conditions for wildlife would remain in their current condition, notwithstanding natural

processes. The No Action Alternative would have no direct effect on turkey. However, dense forest conditions would still occur and the high fire hazard potential would persist, resulting in an indirect adverse effect. There would be no effect to the forest-wide population or habitat trend for turkey.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to turkey population or habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate.

The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2- Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Under Alternative 2, with the exception of cable corridors, all yellow-barked ponderosa pine trees within turkey roosting and nesting habitat would be retained while old tree longevity is improved. Furthermore, old growth recruitment areas are identified within turkey habitat and would add to the potential numbers of turkey roost tree groups. Trees would grow into the larger diameter classes at a faster rate than compared to the No Action Alternative. Alternative 2 would offer higher quality roosting habitat over time due to the increase in VSS 5 and 6 stands.

There would be a complete loss of indicator habitat on approximately 63 acres where cable corridors would be created. There would be an additional loss of habitat quality for 379 acres harvested by cable logging due to the removal of snags for safety purposes. This reduction in habitat quantity and quality is too small to alter the forest-wide habitat or population trends.

Cumulative Effects
There are additional cumulative effects from vegetation modification activities occurring in other projects, including hazard tree removal for powerlines and highways, as well as tree removal for development of state and private lands. Generally, projects on Forest Service lands are designed to move toward the desired conditions for turkey. Cumulatively, when combining the effects from these projects with the effects from Alternative 2, there would not be an effect to the forest-wide population or habitat trend for turkey.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to turkey indicator habitat would be similar as Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be no additional loss of habitat quantity due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. Helicopter logging on 378 acres of indicator habitat would require the removal of snags for safety purposes, reducing habitat quality in those areas. This loss of habitat quality would be too small to alter the forest-wide habitat or population trends.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to turkey habitat would be similar to Alternatives 3 and 4; however, there would be fewer acres treated in ponderosa pine indicator habitat. Under Alternative 4, there would be no additional loss of habitat quantity from cable corridors or reduced quality from loss of snags as no areas would be harvest by cable or helicopter logging. Alternative 4 would treat 3,846 acres in ponderosa pine, 1,019 less than Alternatives 2 and 3, reducing the acres that would be treated to develop into larger size classes. This alternative would not reduce habitat quality or quantity enough to change the forest-wide habitat or population trends.

Elk

The Forest Plan designates elk as an MIS for early-seral stages of ponderosa pine, mixed conifer, and spruce-fir habitat types. Grasslands and early-seral stage woodlands are also important to this species. Elk are associated with the deciduous thickets and early-seral stages of forests that contain an interspersion of the grass/forb vegetation type. Forest-wide population trend is currently stable to increasing. There was an increase in elk numbers in the early to mid-1990s with a gradual decline back to late 1980s level.

The analysis area provides summer range for elk and is located within AZGFD GMU 7E (Dry Lake Hills) and 6A (Mormon Mountain). GMU 7 shows a generally increasing trend in elk numbers. The AZGFD Draft Elk Management Plan's (November 2013) management objective is to continue to reduce the population for the two year period covered by this plan and then stabilize the following years. For GMU 6A, the objective is to stabilize this population.

Existing Conditions
Population trend. The forest-wide trend is stable. Elk numbers on the Forest increased in the early to mid-1990s, with a gradual decline through 2001 to roughly the 1980s level. Elk are found throughout the project area but not in high numbers.

Habitat Trend; early seral ponderosa pine. The forest-wide trend for early-seral ponderosa pine, pinyon juniper, mixed conifer and spruce-fir is increasing slightly.

Alternative 1 – No Action Alternative

Direct and Indirect Effects
Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. Under the No Action Alternative, there would be no direct effect on population trends for elk. However, dense forest conditions would still occur and the high fire hazard potential would persist, resulting in an indirect adverse effect on habitat. Dense forest conditions would not reduce pressure to aspen which are documented to have limited regeneration due to dense forest conditions.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to elk population and habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2- Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Alternative 2 would increase the amount of early-seral stage ponderosa pine by 63 acres and increase early-seral stage mixed-conifer by 178 acres Through the creation of cable corridors (Appendix C – Table 37) resulting in a direct beneficial effect on habitat. Additionally, open canopy areas in ponderosa pine and mixed conifer would increase throughout the project area, increasing foraging habitat quality and quantity for elk. This is anticipated to distribute elk foraging throughout the project area. This increase in habitat quality and quantity is too small to alter forest-wide population and habitat trends.

Cumulative Effects
Other projects across the forest were designed to move toward a more open forest structure improving indicator habitat for elk. This project would combine with other projects to increase habitat. There would be no effect to forest-wide population or habitat trends.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to elk habitat would be similar to Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would be no increase in early-seral habitat due to the absence of proposed cable corridors. These changes are too small to alter the forest-wide habitat or population trends.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to elk indicator habitat would similar to Alternatives 2 and 3; however there would be fewer acres treated to increase indicator habitat. Alternative 4 would treat 3,845 acres in ponderosa pine, acres 1,020 less than Alternatives 2 and 3. This alternative would still have beneficial effects by creating openings within the ponderosa pine and thereby improving vegetative diversity, resulting in improved habitat. This alternative would have the least amount of increased indicator habitat of all the action alternatives.

Hairy Woodpecker

The Forest Plan designates the hairy woodpecker a MIS for snags in ponderosa pine, mixed conifer, and spruce-fir forests for suitable nesting and feeding habitat. Hairy woodpeckers are most abundant in mature forests with large old trees suitable for cavity nesting and are also common in medium-aged forests. Hairy woodpeckers prefer forests with dense canopies (Bushman and Therres 1988). They use tree cavities for roosting and winter cover and may excavate new cavities in fall to be used for roosting (Sousa 1987).

Data from the Coconino National Forest, as well as state-wide data, indicate that hairy woodpecker populations are stable, or slightly increasing on the Forest. Forest-wide, the snag component in ponderosa pine forest has declined, but has increased in mixed conifer and spruce-fir forest due to wildfire and insect outbreaks/disease. Hairy woodpeckers are fairly common in conifer forest types within the project area.

Existing Conditions
Population trend. The forest-wide trend is stable, or slightly increasing. Minor population decreases occur on a short-term scale of 1-3 years, but are generally followed by a recovery (USDA 2002). Hairy woodpeckers were documented to occur throughout the project area.

Habitat trend; snag component of ponderosa pine, mixed conifer, and spruce fir. Ponderosa pine snags are increasing, and the large snag component is stable. Large snags remain below Forest Plan guidelines. The best information available indicates conflicting trends for mixed- conifer and spruce-fir snags, both overall and the large tree component. Regardless, snags remain below Forest Plan standards.

Alternative 1 – No Action Alternative

Direct and Indirect Effects
Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would have no direct effect on hairy woodpeckers. However, dense forest conditions would still occur and the high fire hazard potential would persist, resulting in indirect adverse effects.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to hairy woodpecker population and habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2- Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Under Alternative 2, management of old growth, MSO habitats, northern goshawk PFAs and snags would provide habitat for the hairy woodpecker. Alternative 2 progresses stands to larger VSS classes providing for more recruitment snags over the long-term; however there may be some losses of snags immediately after treatment, which would slightly reduce habitat quantity and quality over the short-term. There would be an additional 378 acres of ponderosa pine and 912 acres of mixed conifer where a majority of snags would be lost due to the creation of cable corridors and harvesting with cable logging which requires snags to be cut for safety purposes. Design features include saving patches of snags within areas cable logged to ensure a more consistent distribution of snags. This loss of snags would not alter enough habitat to affect the forest-wide habitat or population trend for the hairy woodpecker.

Cumulative Effects
The continued development of private land would reduce habitat for these species. Removal of hazard trees for powerlines, trails and roads would reduce snags and habitat for snag- dependent species. However, these activities combined with the effects of Alternative 2 are not expected to reduce habitat quality enough to alter forest-wide population or habitat trends.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to hairy woodpecker indicator habitat would be similar to Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the loss of snags would be less due to the absence of proposed cable corridors, which would reduce the need to remove snags. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to

be treated with steep-slope machinery. Snags would be removed on 296 acres of ponderosa pine and 676 acres of mixed conifer to in areas logged by helicopter for safety purposes. Design features would reduce the impact of this safety measure by providing patches of snags up to 10 acres in size in these areas to distribute snags more consistently across the landscape.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to hairy woodpecker indicator habitats would similar to Alternatives 2 and 3; however there would be fewer acres treated in ponderosa pine and mixed conifer habitatsNo cable logging or helicopter logging would occur under this alternative, which would reduce the need to remove snags on steep slopes and also the need to create corridors. Under Alternative 4, the wet mixed conifer belt and MSO nest cores would not be treated in the Mormon Mountain area. Alternative 4 would treat 3,846 acres in ponderosa pine and 1,896 acres in mixed conifer, 1,019 acres and 2,090 acres less than Alternatives 2 and 3, respectively.

Mule Deer

The Forest Plan designates the mule deer as an MIS for early-seral stages of aspen and pinyon-juniper woodlands. The MIS report did not state an amount of early-seral aspen. The Forest Plan estimates 3,450 acres of aspen on the Forest. For the Forest Plan Revision (in progress), aspen is not defined by its own Potential Natural Vegetation Type (PNVT); instead it is primarily within the Mixed Conifer with Aspen PNVT which contains 37,083 acres. Early-seral stages of ponderosa pine, mixed conifer, and chaparral habitats are also important for this species. Mule deer primarily browse on green shoots and fruits of shrubs and trees, but also feed on grasses and forbs. Over the life of the Forest Plan, a generally declining trend in mule deer has been observed on the Forest, with some modest recovery occurring over the last few years. Summer mule deer habitat occurs throughout the project area.

Population trend. The forest-wide trend is declining. The number of deer seen per hour and the number of fawns per 100 does from 1985 through 2001 varies, but the trend is declining. In good years, fawn production has been at levels minimal to sustaining populations, but in poor precipitation and forage years, fawn production has not kept up with mortality rates.

Habitat Trend; early-seral stages of aspen.
Aspen: Forest-wide trend is declining. Some early-seral stage stands are being created through wildfire and management activities, but recruitment is limited primarily due to grazing by animals. Management activities have not been implemented to a level, or over enough area, to prevent loss of aspen patches and provide adequate aspen recruitment. There are 22 acres of aspen cover type and varying sizes and distribution of patches of aspen within the mixed conifer.

Pinyon Juniper: Forestwide, early-seral pinyon juniper is increasing slightly.

Alternative 1 – No Action Alternative

Direct and Indirect Effects
Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The No Action Alternative would result in continued loss of aspen habitat for mule deer, resulting in a direct adverse effect to habitat. Pine encroachment and browsing by ungulates would continue to reduce the ability of sites to develop into mature aspen stands important to mule deer. Dense forest conditions would still occur and the high fire hazard potential would persist, resulting in additional indirect adverse effects on habitat. However, this alternative would have no

direct effect on forest-wide population or habitat trends.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to mule deer population or habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. The No Action Alternative would not add any additional disturbance to wildlife species or modify habitat components within the analysis area.

Alternative 2- Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Under Alternative 2, aspen restoration treatments would increase early-seral aspen habitat slightly, resulting in a direct beneficial effect to habitat. Alternative 2 would treat 22 acres of late-seral aspen, less than 1 percent of forest-wide habitat. Additional acres would be treated within the mixed conifer cover type to promote aspen recruitment within the mixed conifer. Treatments would maintain late-seral aspen while improving recruitment. This alternative would contribute positively to the forest-wide habitat but would not treat enough to change the forest-wide habitat trend. Mule deer utilize a variety of habitats and this improvement in early seral-stage aspen would not change the forest-wide population trends.

Cumulative Effects
Alternative 2 would have no effect to forest-wide population or habitat trends; however there would be a slight beneficial effect to forest-wide habitat from aspen treatment. Combined with effects from past, present or reasonably foreseeable projects, no cumulative effects to population trends are anticipated. Past and current livestock and ungulate grazing and browsing has contributed to the declining habitat trend; however treatments proposed for the project area are still anticipated to have a slight beneficial effect to habitat and would combine with other projects designed to improve aspen regeneration on the Forest.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to mule deer and mule deer habitat would be similar to Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. No cable logging would occur under this alternative, which would reduce the need to create corridors thereby reducing the creation of openings that may help to promote aspen regeneration within the mixed conifer.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to indicator habitat would be similar to Alternatives 2 and 3; however there would be fewer acres treated in mixed conifer and aspen habitats. Under Alternative 4, the wet mixed conifer belt and MSO nest cores on Mormon Mountain would not be treated. Alternative 4 would treat 1,896 acres in mixed conifer across the project area. This reduction in treatment acres would reduce the number of patches of aspen that may be treated within the mixed conifer, and the aspen component could be lost overtime. This alternative treats the least amount of aspen of all the action

alternatives; however, it would not result in a change in mule deer forest-wide population or habitat trends.

Red-naped (Yellow-bellied) Sapsucker

The Forest Plan designates the red-naped sapsucker a MIS for the late-seral stage and snag component of aspen. Red-naped sapsuckers nest primarily in aspen, or in deciduous/mixed conifer forest, often near water. Live trees are preferred, although dead trees (usually spruce or other conifers) are used at times. This species excavates a new hole each year. They extricate sap and soft cambium layer around willows, cottonwoods, aspen and walnuts. Nest trees are a minimum dbh of 10 inches with a minimum height of 15 feet. They favor groups of large aspens near heads of higher elevation canyons during the summer.

The forest-wide habitat trend is declining. The MIS report did not state an amount of early-seral aspen. The current Forest Plan estimates 3,450 acres of aspen on the Forest. For the Forest Plan Revision (in progress), aspen is not defined by its own Potential Natural Vegetation Type (PNVT); instead it is primarily within the Mixed Conifer with Aspen PNVT which contains 37,083 acres. On the Forest, mid- to late-seral stage aspen are declining, due to both natural causes and management actions to regenerate stands. Some early-seral stage stands are being created through wildfire and management activities, but recruitment is limited primarily due to grazing by animals. The forest-wide snag distribution of aspen has been declining throughout the Forest Plan implementation period. Currently, most aspen on the Forest is in the older age classes, providing habitat for sapsuckers, but future forest-wide trends are of concern since aspen regeneration remains an on-going problem.

Existing Condition

Population Trend. Available population data on the Forest comes from Christmas bird count, Breeding Bird Surveys, and long-term research conducted along the Mogollon Rim. Collectively, these data indicate that red-naped sapsucker populations fluctuate overtime, but are indicate that the trend is probably declining (USDA 2013).

Habitat Trend for late seral aspen. Forest-wide trend is declining. The MIS report did not state an amount of late-seral aspen. On the Forest, mid-to late-seral stage aspen are declining, due to both natural causes and management actions to regenerate stands. Some early-seral stage stands are being created through wildfire and management activities, but recruitment is limited primarily due to grazing by animals. Management activities have not been implemented to a level, or over enough area, to prevent loss of aspen patches and provide adequate aspen recruitment. For the FWPP area, the average density of aspen snags 18 inches dbh and greater is 0.1 per acre; however snags greater than 12 inches dbh are 20 per acre. Current snag densities in aspen provide habitat for red-naped sapsuckers. The lack of recruitment for late-seral stage aspen is a concern as these snags would become logs, another important habitat component.

Alternative 1- No Action Alternative

Direct and Indirect Effects

Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. The project area contains 22 acres of late seral aspen or less than one percent of forest-wide habitat. The No Action Alternative would result in continued loss of aspen habitat for sapsuckers, resulting in an indirect adverse effect to habitat. Pine encroachment and browsing by ungulates would continue to reduce the ability of sites to develop into mature aspen stands important to sapsuckers. Dense forest conditions would still occur and the high fire hazard potential would persist, resulting in additional indirect adverse effects on habitat. Late-seral aspen

would be lost with no young aspen to replace it. This could potentially cause a decline in population trends forest-wide, resulting in an indirect adverse effect to population trends.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to red-naped sapsucker population and habitat trends. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place populations and habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate. Late- and early-seral aspen would continue to be lost due to conifer encroachment and ungulate grazing and browsing, resulting in a loss of forest-wide habitat and therefore a loss of forest-wide population.

Alternative 2- Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Alternative 2 would treat 22 acres of late-seral aspen, or less than one percent of forest-wide habitat. Treatments would maintain healthy late-seral aspen and would treat unhealthy stands with high tree mortality to encourage recruitment. Late-seral aspen would be expected to increase over the long term. Alternative 2 would contribute positively to the forest-wide habitat trend.

Cumulative Effects
Past and current livestock and ungulate grazing and browsing has contributed to the declining habitat trend; however continued authorization of livestock grazing through the NEPA process minimizes the effects of livestock grazing on herbaceous ground cover from managed livestock use. However, some negative effects to the quality and quantity of wildlife food and cover may occur due to ungulate grazing and browsing. Alternative 2 combined with past, present and reasonably foreseeable projects are anticipated to have beneficial effect to forest-wide population and habitat trends.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to red-naped sapsucker habitat would be similar to Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistently random due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. No cable logging would occur under this alternative, which would reduce the need to remove the large trees and logs on steep slopes and also the need to create corridors. This would reduce the number of large trees and snags cut within PACs and wet mixed conifer in the Mormon Mountain area.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
Effects to indicator habitat would be similar to Alternatives 2 and 3; however there would be fewer acres treated in mixed conifer and aspen habitats. Under Alternative 4, the wet mixed conifer belt and MSO nest cores on Mormon Mountain would not be treated; however treatments would occur above and below that belt and within the Schultz MSO nest core on Dry Lake Hills. Alternative 4 would treat approximately 1,896 acres in mixed conifer. This reduction in treatment acres would reduce the number of patches of aspen that may be treated within the mixed conifer and the aspen

component could be lost overtime. This alternative treats the least amount of aspen of all the action alternatives; however it would not result in a change in the red-naped sapsucker forest=wide population or habitat trends.

Pronghorn Antelope

Pronghorn antelope is designated a management indicator species for the early-and late-seral grassland type, which is represented by MAs 9, 10 and 11 in the Forest Plan. Management Area 11 (Verde Valley) is not present in FWPP.

A number of factors have been identified that affect pronghorn including severe weather, amount and timing of precipitation, long-term climatic trends, habitat fragmentation, diet overlap with other grazers, reductions in fawn hiding cover, woody vegetation encroachment, fences, human disturbance and development, water availability, predators, parasites and diseases, and nutritional concerns (Nelson 1925; Neff 1986; Neff and Woolsey 1979; O'Gara 1986; Smith et al. 1986; Le Count 1987; Lee et al. 1998; AGFD 2002; Dubay 2002; Ockenfels 1996 in USDA 2002).

Forest-wide population estimates of pronghorn were made in the 1980s and ranged from around 1005-1700; populations were thought to be increasing (USDA FS and AGFD 1981; USDA FS and AGFD 1990; USDA FS 1982; USDA FS 1987b in USDA 2002).

Existing Conditions
Population trend. The forest-wide population trend is stable. Pronghorn population indicators have fluctuated since the late 1980s, with fawn:doe ratios showing greater fluctuation than number of pronghorn observed per hour. Within the range of fluctuations, the population appears to be relatively stable, with fawn:doe ratios increasing somewhat over approximately the last 10 years. The Dry Lake Hills project area is in GMU 7 and Mormon Mountain is in GMU 6A. Pronghorn have not been documented in either project area.

Habitat trend; early-and late-seral grasslands. Habitat trend is stable to declining. Although the total amount of grassland habitat has generally remained stable, habitat quality is stable to declining due to tree encroachment, fire suppression, long-term climatic changes, short-term drought, and ungulate grazing. Meadows and openings have been negatively affected by pine encroachment fragmenting habitat for pronghorn. There are 60 acres of grassland habitat within the project area.

Alternative 1 – No Action Alternative

Direct and Indirect Effects
Habitat conditions for wildlife would remain in their current condition, notwithstanding natural processes. Under the No Action Alternative, grassland restoration would not occur, and favorable habitat for pronghorn would decrease over time as conifers would continue to encroach into those grasslands, resulting in an indirect adverse impact to habitat. Dense forest conditions would still occur and the high fire hazard potential would persist, resulting in an indirect adverse impact. However, the No Action Alternative is expected to have no effect on forest-wide population trends.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to antelope population or habitat trends. The cumulative effects of the No Action Alternative would be to reduce the grassland acres within National Forest System lands, as dense forest conditions would continue to place populations and habitat at risk of habitat loss. The fire hazard would increase over time as

vegetation would continue to grow and fuel would continue to accumulate, continuing to have a negative effect on grassland habitats.

Alternative 2- Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Under Alternative 2, 60 acres of grasslands would be restored, resulting in direct beneficial effect to habitat. Grassland restoration would increase vegetative species composition and diversity and improve the distribution and diversity of vegetative ground cover. Alternative 2 would result in both an increase of habitat and an increase in habitat quality for pronghorn. However, the increase in habitat quality is too small to alter forest-wide population trends.

Cumulative Effects
Alternative 2 would have no effect to forest-wide population trends; however there would be a beneficial effect to habitat trends from grassland restoration treatments. Combined with effects from past, present or reasonably foreseeable projects, no cumulative effects to population trends are anticipated. Past and current livestock and ungulate grazing and pine encroachment has contributed to the declining habitat trend; however treatments proposed for the project area are still anticipated to have beneficial effects to habitat.

Alternative 3 – Proposed Action without Cable Logging

Direct, Indirect and Cumulative Effects
Effects to pronghorn habitat would be similar to Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same.

Alternative 4 – Minimal Treatment Approach

Direct, Indirect and Cumulative Effects
This alternative would treat 53 acres of grassland habitat in the Dry Lake Hills project, 7 acres less than Alternatives 2 and 3. This change in habitat quality is not enough to change the forest-wide habitat or population trend for pronghorn.

Migratory Birds

President Clinton signed Executive Order 13186 on January 10, 2001, placing emphasis on conservation of migratory birds. This order requires that an analysis be made of the effects of Forest Service actions on Species of Concern listed by Partners in Flight and the Birds of Conservation Concern, the effects on Important Bird Areas (IBAs) identified by Partners in Flight (Latta, et al. 1999), and the effects to important overwintering areas.

Within the project area there are mixed conifer, ponderosa pine, aspen and grasslands habitat types. A portion of the Mormon Mountain project area is within the Anderson Mesa Important Bird Area (IBA). There are no important overwintering areas within FWPP.

Species of Concern Listed by Partners in Flight and USFWS
The Arizona Partners in Flight (APIF) Plan and the Birds of Conservation Concern (BCC) lists priority species of concern. A total of 14 species have been identified as species of concern in FWPP habitats. Project effects to Mexican spotted owl, northern goshawk and red-naped sapsucker are discussed in detail under the Threatened, Endangered, Sensitive Species and

MIS sections of this report. Refer to Table for the additional neotropical migratory bird species addressed in this analysis.

The following table summarizes the PIF priority species and BCC, and those that are or have the potential to occur in the analysis area by habitat type and associated habitat needs.

Table 33: Acres of Migratory Bird Habitat within the FWPP Area

Species	Habitat	Acres of Habitat within the Project
Olive-sided Flycatcher	Mixed Conifer	DLH- 3118 MM – 1051
Cordilleran	Ponderosa Pine	DLH – 4336 MM - 1923
Olive Warbler		
Greater Pewee		
Grace's Warbler		
Lewis' Woodpecker		
Flammulated Owl		
Purple Martin		
Swainson's Hawk	High Elevation Grassland	DLH – 60 MM – 0
Grasshopper Sparrow		
Swainson's Hawk		
Western Burrowing Owl		
Ferruginous Hawk		
Red-naped Sapsucker	Aspen	DLH – 22

Olive-sided Flycatcher

The olive-sided flycatcher prefers forest openings and edges within mature ponderosa pine and mixed conifer forests with snags. They prefer areas abundant with snags and trees with dead limbs, where they forage on insects, and semi-open stands with low canopy cover.

Cordilleran Flycatcher

Cordilleran flycatchers are considered a common summer resident and uncommon transient (Morrall and Coons 1996). They are associated with snags and high overstory canopy closure. Stands of old growth ponderosa pine and closed canopy forest within the project area occur in small patches, on steep slopes, or in pine stringers in small drainages. Cordilleran flycatchers are considered to be on the increase, but at risk due to concerns about loss of suitable habitat and habitat components such as snags, downed logs, and loss of closed canopy. Within the project area, it is expected that this species is static to increasing.

Olive Warbler

Distribution of olive warblers in the state extends along the Mogollon Rim but they also occur in southeastern Arizona. Olive warblers are found primarily in open ponderosa pine forests, including those forests with a Gambel oak component. They are also found regularly in mixed conifer forests. In southeastern Arizona, they occur in madrean pine- oak forests

characterized by an overstory of ponderosa pine with an understory of several species of evergreen oaks and alligator juniper. The migratory birds arrive in March to nest and have been heard singing through July. Cup nests are built in conifers. These birds have been document hosts for brown-headed cowbirds in Arizona. This species was detected on the Coconino National Forest during the Breeding Bird surveys.

Greater Pewee

Arizona is the very northern portion of this species' range, and greater pewees occur along the Mogollon Rim and in southeastern Arizona. They occupy open ponderosa pine forests, including those forests with a Gambel oak component. Greater pewees are also found regularly in mixed conifer forests. In southeastern Arizona, where they are found more frequently, they occur in madrean pine-oak forests characterized by an overstory of ponderosa pine with an understory of several species of evergreen oaks and alligator juniper. This species was detected on the Coconino National Forest during the Breeding Bird surveys. Greater pewees arrive in March, nest in mid-May through mid-July, and are still feeding fledglings into August. Nests are typically constructed in ponderosa pine and are placed on a horizontal limb in the top half to third of the tree.

Grace's Warbler

Grace's warblers primarily occur in ponderosa pine forests, but are occasional found in mixed conifer and pinyon-juniper woodlands. Grace's warblers arrive mid to late April, nest mainly in mid-June and mid-July, with nesting occurring as late as the end of July. These warblers place their compact, cups-like nests well away from the trunk in the cluster of needles at the end of branches. Their range within Arizona is mainly along the Mogollon Rim, with some occurrences in the northeast, southeast, and northwest portions of the state.

Lewis' Woodpecker

Lewis' woodpeckers are found in open ponderosa pine (including pine/oak) forests and riparian woodlands from about 6,200 to 8,900 feet in elevation. They use brushy understories, snags for perching, and open areas for foraging; all of which is frequently provided in burn areas. They nest in the abandoned cavities of other woodpeckers, in natural cavities, or make their own cavities. They nest most frequently in ponderosa pine or cottonwood trees. While most Lewis' woodpeckers are resident some migrate to lower elevations.

Flammulated Owl

These owls nest in old growth coniferous forests including ponderosa pine, pine/oak, and mixed conifer, where they nest in natural cavities of live trees, snags, and dead limbs or abandoned cavities of flickers and sapsuckers. Flammulated owls arrive mid-April, with breeding occurring into July. Migration south occurs from August through October.

Purple Martin

Purple martins are an uncommon summer resident in ponderosa pine (Morrall and Coons, 1996; USDA 2000b). This species has been nearly extirpated from ponderosa pine forests since fire suppression has resulted in much denser conditions and historic logging reduced the number of snags and large old trees. Breeding bird survey data indicates that this species is static to slightly declining.

Swainson's Hawk

These hawks occur in large expanses of open grasslands that may have interspersed shrubs and trees. They nest in trees such as cottonwoods, acacia, and junipers. They eat a wide variety of items, including insects, reptiles, birds, and small mammals.

Grasshopper Sparrow

These sparrows nest in southeast Arizona, but are rare transients/migrants on the Coconino National Forest in grasslands and wetlands.

Western Burrowing Owl

Burrowing owls are found in flat, open, low-stature grasslands, sparsely vegetated desert-shrub, and edges of human-disturbed land. These owls take over burrows of prairie dogs and ground squirrels, and dens of coyote, fox and badger. They are also known to use artificial burrows. These owls also need perches, such as mounds and fence posts. They primarily eat insects and small mammals, but are known to take other small-sized species. There are no grasslands with burrows present in the project area.

Ferruginous Hawk

Ferruginous hawks historically nest in open shrublands, woodlands, and grasslands in southeastern and northern Arizona. Their habitat is comprised of open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, and desert. They need diverse early successional states of grasslands and herbaceous ground cover to support prey with low canopy cover. Prairie dog towns are wintering sites as they provide a concentrated prey source. Ferruginous hawks forage in montane subalpine grasslands in the Flagstaff vicinity.

Alternative 1 – No Action Alternative

Direct and Indirect Effects

Under the No Action Alternative, there would be no changes in the project area. Habitat conditions for birds would generally remain the same, notwithstanding natural processes. The No Action Alternative would have no direct effect on migratory birds. However, dense forest conditions would continue to place forest-dwelling migratory bird habitat at risk with respect to stand-replacing fire, resulting in indirect adverse effects.

Cumulative Effects

The No Action Alternative would maintain the current fire risk to migratory bird habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place migratory bird habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have a negative effect to migratory birds. Unintentional take could occur to migratory birds if habitat is not protected. The No Action Alternative when added to past, present and reasonably foreseeable future actions would put migratory bird habitat at greater risk.

Alternative 2 - Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects

Under Alternative 2, northern goshawk, Mexican spotted owl, ferruginous hawk, burrowing owl, and red-naped sapsucker are discussed in previous pages of this report. Proposed activities may affect these species directly through habitat modification, or indirectly through changes in prey populations.

Under this alternative, approximately 4,865 acres of ponderosa pine habitat would be treated. Of that, 2,201 acres is pine/oak. Eight species have been identified as species of concern in pine-pine/oak habitats. They are northern goshawks, Cordilleran flycatchers, olive warblers, greater pewee, Grace's warbler, Lewis's woodpecker, flammulated owl and purple martin. Species associated forest openings and edges such as the purple martin would benefit from fuels reduction treatments. Due to the creation of openings within the project, there would be a slight increase in prey availability within the project. Through vegetation modification this project would create some open habitat and reduce tree densities which favor early succession birds. However, the project area would continue to support mostly mid-succession and late-succession vegetation stages. Burning would likely have short-term beneficial effects by temporarily increasing insect abundance.

There would be 63 acres of late-seral ponderosa pine and 178 acres of mixed conifer lost from the creation of cable corridors, which require the removal of all trees and snags. Additionally, snags would be cut for safety purposes in 315 acres of ponderosa pine and 734 acres of mixed conifer proposed for cable logging. This would reduce habitat for species associated with snags such as purple martin, Lewis' woodpecker, flammulated owls and olive-sided flycatchers.

Alternative 2 would treat 3,986 acres of mixed conifer habitat. Most of the high species rich areas are associated with MSO habitat in the project, and treatments are designed to maintain habitat components important for these species as well as forest- dwelling passerine birds.

Under Alternative 2, 22 acres of aspen would be treated. Areas of aspen within the wet mixed conifer would also be treated to create small openings to promote regeneration. Species richness is associated with aspen and red-naped sapsuckers are the species of concern listed for this habitat. Aspen treatments would result in increased size class distribution, increased health, growth and vigor and would increase biodiversity within aspen stands. These treatments would move toward improving habitat not only for red-naped sapsucker but also for a multitude of passerine birds that use this habitat.

This alternative would treat 60 acres of grassland habitat. Species associated forest openings and edges such as the purple martin, Swainson's hawk, ferruginous hawk, burrowing owl and grasshopper sparrow would benefit from restoration treatments including grassland restoration.

In all habitat types, disturbances to individuals from thinning, burning and associated smoke may cause individuals to temporarily move to other areas. Individuals may be directly impacted if burning occurs during times when young are unable to relocate. The effects from smoke and fire would be isolated, of low intensity and short duration. Burning would likely have long-term beneficial effects by increasing insect abundance post-burn.

Effects from vegetation modification and burning treatments would be beneficial due to the creation of openings and more edge effect, the retention of snags and large trees in most areas, with the exception of cable corridors and areas harvested by cable or helicopter logging. MSO protected habitat and developing old growth would continue to provide habitat for species that require old growth coniferous forests such as the flammulated owl and cordilleran flycatcher.

Under the Alternative 2, unintentional take could occur. When prescribed burning occurs during the spring and early summer, there could be some take of migratory birds from smoke impacting breeding birds and potentially impacting nesting success. Unintentional take could occur if occupied snags are burned or cut for safety purposes during implementation.

Design features, such as limiting the duration and timing of operations in MSO and goshawk habitats, lining of snags and logs, lighting techniques designed to reduce the loss of snags and the marking of snag patches up to 10 acres in size in areas logged by cable have been incorporated to reduce the potential for unintentional take to occur.

Cumulative Effects
The area of analysis is the project area. Other cumulative effects that occur within the project area include recreational activities and hazard tree removal. Ongoing recreational activities may result in disturbance of migratory birds. Removal of hazard trees for powerlines, trails and roads would reduce snags and reduce habitat for snag dependent species. Present and future forest health project activities have common objectives to improve current conditions by improving soil conditions, reducing competition of trees, managing for return of the large tree components and providing snags, logs and coarse woody debris in sufficient quantity to provide for raptor species.

Under Alternative 2, treatments would provide protection from stand-replacing crown fires to high species rich habitats. The amount of impacts from vegetation treatments that would occur to migratory birds from implementation of Alternative 2 when added to past, present and reasonably foreseeable future actions is not likely to occur to an extent that there would be a measureable negative effect on migratory bird populations.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects
Effects to migratory bird habitats would be similar to Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistently random due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. Areas helicopter logged would require the removal of most snags for safety purposes. There would be 296 acres of ponderosa pine and 676 acres of mixed conifer harvested by helicopter logging resulting in a loss of snags and potential unintentional "take" of migratory birds as noted above.

Design features, such as limiting the duration and timing of operations in MSO and goshawk habitats, lining of snags and logs, lighting techniques designed to reduce the loss of snags and the marking of snag patches up to 10 acres in size in areas logged by helicopter have been incorporated to reduce the potential for unintentional take to occur.

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to migratory bird habitats under this alternative would be similar to Alternative 2 and 3; however there would be fewer acres treated in pine, pine/oak and mixed conifer habitats. Alternative 4 would treat 3,846 acres ponderosa pine, 1,896 acres in mixed conifer, 53 acres in grasslands and 2 acres of aspen. This reduction in treatment acres would reduce the number of migratory birds that could be impacted by project implementation; however there would also be fewer acres of habitat improvement.

This alternative would have the least amount of disturbance to migratory birds because there would

fewer acres treated and no cable corridors or harvesting by cable or helicopter logging would be required for implementation. Additionally, there would be no noise disturbance associated with helicopter logging.

Cumulative Effects
Cumulative effects are the same as for Alternative 2.

Bald and Golden Eagle Protection Act

All golden and bald eagles, regardless of status, are protected under the Bald and Golden Eagle Protection Act (Eagle Act). This analysis determines if take is likely to occur with implementation of the action alternatives. Take is defined as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." Disturb is further defined "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (72 Fed. Reg.31132).

The U.S. Fish and Wildlife Service (FWS) recommends using Conservation Assessment and Strategy for bald eagles in Arizona (Driscoll et. al. 2006) in conjunction with the Bald Eagle National Guidelines (USDI 2007) to protect bald eagles in Arizona. For golden eagles, the FWS has issued a report titled *Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management* and Permit Issuance (Page et. al 2010).

For bald eagles, details of the existing condition can be found is this document where bald eagles are addressed as a Forest Service Sensitive species.

Golden eagles are found nesting in a wide variety of habitats from arid desert scrub to open conifer forests. No matter what habitat they choose in the state, topography features include tall cliffs or canyon in which to construct a nest and nearby large open areas to forage for prey (AGFD 2005). Most golden eagles nesting in Arizona are primarily residents, remaining within or near their home range throughout the year. In Arizona, cliff ledges are the most common nesting substrate used by golden eagles, but they would also use tall trees (esp. ponderosa pine), junipers, rock outcrops, and in rare cases, transmission towers (Glinski et.al. 1998 in AGDF 2005).

Sightings of golden eagles have been documented and winter surveys are conducted annually on the Flagstaff Ranger District adjacent to the analysis area. Bald eagle annual winter surveys also document golden eagle sightings. There is a confirmed golden eagle nest within the Action Area. Golden eagles often nest in areas of high rabbit populations. Golden eagles are well known for subduing large prey; however most of their diet consists of ground squirrels, rabbits, and prairie dogs. The project has limited foraging habitat for golden eagles with approximately 60 acres of grassland that could provide potential habitat.

Alternative 1 – No Action Alternative

Direct and Indirect Effects
Habitat conditions would remain in their current condition, notwithstanding natural processes. Because there would be no habitat altering activities or disturbance associated with project implementation, this alternative would have no direct effect on the golden eagle. However, dense forest conditions would still occur and the high fire hazard potential would continue to place potential golden eagle nesting and foraging habitat at risk with respect to stand-replacing fire, resulting in indirect adverse effects.

Tree densities would continue to be high, slowing their growth into larger diameter classes and thereby limiting the development of larger diameter (greater than 18 inch dbh) trees important for roosting and perching. This would have an indirect adverse effect on golden eagle habitat.

Cumulative Effects
The No Action Alternative would maintain the current fire risk to eagle habitat and adjacent forest lands. The cumulative effects of the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place eagle habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have a negative effect to golden eagle.

Alternative 2 – Proposed Action with Cable Logging Emphasis on Steep Slopes

Direct and Indirect Effects
Direct effects would be from activities that cause disturbances (smoke, auditory or visual) to golden eagles within or adjacent to the project. Under Alternative 2, there would be no direct effects to nesting or roosting eagles as the nearest nesting eagle is over one-half mile from the project, and noise generated from these activities is not expected to be audible at the nearest nest site. The nest location occurs on a cliff face on a raised topographic feature and it is not expected that smoke would settle around the nest long enough to cause discernible effects to golden eagles because of the air movement in away from this landscape scale feature. Smoke is expected to dissipate and settle in low lying areas overnight, eliminating the potential to impact nesting eagles outside of the project.

Under Alternative 2, mechanical treatments, broadcast and pile burning and hauling of timber may cause visual or auditory disturbance to foraging golden eagles. This disturbance would be localized, of short duration and low intensity and may impact individuals but is not expected to result in "take" of golden eagles.

Indirect effects to the golden eagle include effects to eagle habitat, eagle prey species, or prey species habitat. There are no anticipated adverse effects to prey species or prey species habitat. Indirect effects to habitat would occur from treatments that modify the number of trees in a group of suitable roost trees, as eagles prefer to roost in large trees within close proximity to other large trees. However, thinning would improve old tree longevity, resulting in beneficial effects. Lining of snags would reduce potential mortality to these components from burning activities. In addition, Alternative 2 would include developing old-growth stands in 31% of the area that may be used as future nest or perching sites for golden eagles.

There would be no effect to nesting eagles; however, there may be possible short-term disturbance to potential roosting habitat with long term benefits. Short term disturbance to foraging eagles would occur during thinning and broadcast burning activities and may cause eagles to forage in nearby areas for the duration of the activity.

Cumulative Effects
Short-term impacts associated with Alternative 2 added to similar impacts from past, present, and reasonable foreseeable projects were considered. Implementation of other fuels reduction project activities could occur simultaneously; however, it is not anticipated to combine to cause a negative effect. Other cumulative effects include hazard tree removal for powerlines, communication sites

and highways, which have reduced the number of snags and large trees for perching along potential winter foraging areas in the project area. However, these activities combined with this project's activities are not anticipated to "disturb" eagles to the degree identified in the Act.

Determination of Effect
This determination is based on the above analysis for golden eagles and the analysis in this document where bald eagles are addressed as a Forest Service Sensitive species. The project's activities would not lead to "take" of golden eagles or bald eagles.

Alternative 3 – Proposed Action without Cable Logging

Direct and Indirect Effects
Effects to golden eagle habitat would be similar to Alternative 2 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however the distribution of snags and large trees would be more consistently random due to the absence of proposed cable corridors. Treatments would utilize ground-based harvesting across the majority of the project area, with helicopter logging for critical areas that are too steep, rocky or inaccessible to be treated with steep-slope machinery. No cable logging would occur under this alternative, which would reduce the need to remove the large trees and logs on steep slopes and also the need to create corridors.

The use of helicopter logging would require landings where trees area processed at the landing area with a processor. There are no documented nests within the project however; a previously-used nest is located within one-half mile of the project boundary. Helicopter flights in close proximity to nesting eagles could affect breeding success. Helicopter paths would need to be reviewed to exclude flights over occupied nest locations during the golden eagle breeding season (see design features specific to Alternative 3).

Cumulative Effects
Cumulative effects are the same as Alternative 2.

Determination of Effect
The project's activities would not lead to "take" of golden eagles or bald eagles.

Alternative 4 – Minimal Treatment Approach

Direct and Indirect Effects
Effects to golden eagle habitat would similar to Alternatives 2 and 3 in that the described treatments in Appendix A, Table 1 and desired conditions would be the same; however there would not be as many acres treated. Treatments would utilize ground-based harvesting across the majority of the project area, and helicopters would not be used, reducing the potential for noise disturbance from overflights to nests within the action area. No cable logging would occur under this alternative, which would reduce the need to remove the large trees and logs on steep slopes and also the need to create corridors.

Cumulative Effects
Cumulative effects are the same as Alternative 2 and 3.

Determination of Effect
The project's activities would not lead to "take" of golden eagles or bald eagles.

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Appendix A – Proposed Treatment Descriptions, Objectives

Table 34: Proposed Treatment Descriptions/Objectives

Treatment Type	Treatment Description/Objective	Acres
Ponderosa Pine Fuels Reduction	These treatments areas are outside of MSO PACs and northern goshawk PFAs and nest cores. Mechanical treatment designed to develop uneven-aged structure and a mosaic of openings and tree groups of varying sizes. Openings would occupy approximately 20 percent of the treatment area. Tree groups would vary in shape, size, density, and number: generally from 0.05 – 0.7 acres in size with residual group basal areas of 20-80 ft2 per acre and 2-40 trees per group.	1865 – Dry Lake Hills (DLH) 766 – Mormon Mountain (MM)
Ponderosa Pine Fuels Reduction – Hand Thinning	This treatment includes steep areas that have low tree density and/or are dominated by smaller diameter trees where the purpose and need can be met through hand felling treatments. Where practical and feasible, treatments would be designed to develop uneven-aged structure and a mosaic of tree groups of varying sizes similar to the treatment described above.	150 - DLH
Mixed Conifer Fuels Reduction	These treatments areas include dry mixed conifer areas outside of MSO PACs, replacement nest/roost habitat, and northern goshawk PFAs and nest cores, but include MSO restricted habitat. Mechanical treatment designed to develop uneven-aged structure and a mosaic of openings and tree groups of varying sizes. Trees above 24" dbh would not be cut except if necessary for cable corridor locations.[4] Openings would occupy about 10-20 percent of the treatment area. Tree groups would vary in shape, size, density, and number: generally	1140 - DLH

[4] Cable corridors require the removal of trees within the corridor itself as well as hazard trees within the cable logging unit to ensure safe operations.

Treatment Type	Treatment Description/Objective	Acres
	less than one acres in size with residual group basal areas of 30-90 ft2 per acre and 2-50 trees per group.	
Mixed Conifer Fuels Reduction – Hand Thinning	This treatment includes areas where fuels reduction objectives can be met through hand thinning of trees $\leq$ 9" dbh; where mechanical treatment could cause high levels of resource damage; or where mechanical treatments would be cost-prohibitive.	132 - DLH
MSO PAC Fuels Reduction - Wet Mixed Conifer	This treatment would create small openings by hand within and around aspen patches to promote regeneration. Dead and down material would be piled for burning to reduce the heavy fuel loading and allow for lower-intensity prescribed burning. Trees over 18" dbh would not be cut.	180 - MM
MSO PAC Fuels Reduction	Mechanical treatment to create a diversity of tree patch sizes with minimum patch size of 2.5 acres. Provide for 10 percent openings across treatment areas from 0.1 – 2.5 acres in size. Maintain a minimum of 40 percent canopy cover in pine/pine-oak and 60 percent in mixed conifer. Post-treatment, trees greater than 16" dbh would contribute at least 50 percent of the stand basal area per MSO Recovery Plan guidelines (2012, pp. 276-277). Trees above 18" dbh would not be cut except if necessary for cable corridor locations.	1167 – DLH 1592 - MM
MSO PAC Fuels Reduction – Hand Thinning	This treatment includes steep areas which have low density and dominated by smaller trees or are in areas not conducive to cable yarding operations. Where feasible, treatments would have similar objectives to those described in the MSO PAC Fuels Reduction treatment above, with the limitation that cutting would be limited to	202 – DLH

Treatment Type	Treatment Description/Objective	Acres
	trees up to 9” dbh due to the constraints of hand thinning operations. Otherwise treatments would be thin from below up to 9” dbh to reduce density and fuel ladders.	
MSO Nest Fuels Reduction	Hand thinning up to 5” dbh would occur within 80 % of the Schultz Creek nest core in coordination with the US Fish and Wildlife Service (122 acres, DLH). Approximately 20% of the nest core would be deferred from treatment in order to maintain denser patches for habitat. Residual basal area would be a minimum of 110 ft2, and treatment would maintain a minimum of 60% canopy cover in mixed conifer. Dead and down material in MSO nest cores would be piled by hand and burned (261 acres in DLH and 402 acres on MM).	383 – DLH 402 – MM
MSO Nest/Roost Recovery – Hand Thinning	Hand thinning up to 9” dbh would occur on 72 acres in DLH under this treatment, and dead trees less than 12” dbh and down material would be cut and piled by hand for prescribed burning. Thirty-seven acres of Nest/Roost Recovery habitat would be prescribed burned only (no hand thinning). Snag retention guidelines identified in the Forest Plan would still be followed (see Design Features – Snags). Treatments would be designed to move the stands towards minimum desired conditions: Residual basal area of 110 ft2 in ponderosa pine, and 120 ft2 in mixed conifer; canopy cover of 40 percent in pine/pine-oak and 60 percent in mixed conifer; 12 trees per acre greater than 18” diameter; trees from 12-18” dbh would comprise over 30 percent of stands BA, and trees greater than 18 inches would comprise an additional 30% of BA.	109 - DLH
MSO Nest/Roost Recovery –	Mechanical treatment would remove ponderosa pine in a variety of size classes up	22 - MM

Treatment Type	Treatment Description/Objective	Acres
Mechanical Thinning	to 24" dbh. Target basal area would be 95 ft2, and no oak would be cut.	
Northern Goshawk Post Fledging Areas (PFA) Fuels Reduction	Uneven-age mechanical treatment designed to develop uneven-aged structure and a mosaic of tree groups of varying sizes. Openings would occupy 20 percent of the treatment area. Tree groups would vary in shape, size, density, and number: generally from 0.05 – 0.7 acres in size with residual group basal areas of up to 30-90 ft2 per acre and 2-40 trees per group.	359 - DLH
Northern Goshawk Nest Fuels Reduction	Mechanical treatment designed to develop northern goshawk nest stand conditions consisting of a contiguous over-story of large trees. Basal area of 70 ft2 or greater would be maintained, and Forest Plan guidelines for canopy cover would be met.	100 - DLH
Aspen Treatment	A variety of different treatments would be used to promote and protect aspen health and regeneration, including the removal of post settlement conifers within 100 feet of aspen clones, prescribed fire, ripping, planting, fencing and/or cutting of aspen to stimulate root suckering.	22 – DLH
Grassland Restoration	Mechanical treatment to remove encroaching post-settlement conifers and restore the pre-settlement tree density and patterns.	60 – DLH
Burn Only	Burn only treatment would remove excessive fuel loading in areas which were previously burned by the 1977 Radio Fire.	270 - DLH
Electronic Site – Structure Protection	These sites are occupied by telecommunication facilities, and would be treated to provide a sufficient defensible space around these structures from a wildland fire. Individual trees that are determined to contribute to wildfire risk or	6 – DLH 12 - MM

Treatment Type	Treatment Description/Objective	Acres
	pose a hazard to the electronic sites would be removed. The remainder of the sites would receive a thin from below to approximately 20 – 40 ft2 basal area with the purpose of raising the crown base height and leaving the largest and most fire resistant trees.	
No Treatment (No New Analysis)	These acres include non-treatable areas, including rock faces and boulder fields, and the Orion Timber Sale (approximately 837 acres). Though the Timber Sale is within the project boundary, the treatments for that area were analyzed and authorized under the Jack Smith Schultz Fuels Reduction and Forest Health Restoration Project Decision Notice/Finding of No Significant Impact (2008). No additional treatments within the Timber Sale area are proposed under FWPP.	1605 - DLH

Appendix B – Snag Numbers/Acre by Alternative immediately post treatment and 20 and 40 years post treatment.

Table 35 Snags/acre > 18" diameterbreast height (DBH) and > 12" DBH immediately after treatment by alternative

	Description	Snag Size	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Project Area	Dry Lake Hills	≥12”	6.4	5.1	5.1	5.5
		≥18”	2.2	2.2	2.1	2.2
	Mormon Mountain	≥12”	10.6	10.1	10.5	10.8
		≥18”	3.6	3.5	3.7	3.7
Cover Type Dry Lake Hills	Ponderosa Pine	≥12”	3.6	3	3.2	3.3
		≥18”	2.1	1.9	1.9	1.8
	Mixed Conifer	≥12”	8.8	7.4	6.8	8.4
		≥18”	2.4	2.4	2.3	2.6
	Aspen	≥12”	19.9	19.9	19.9	19.9
		≥18”	.1	.1	.1	.1
Cover Type Mormon Mountain	Ponderosa Pine	≥12”	3.9	4.6	4.6	4.6
		≥18”	.7	.7	.7	.7
	Mixed Conifer	≥12”	23.4	20.9	22.2	22.4
		≥18”	9.3	8.4	9	9
	Wet Mixed Conifer	≥12”	25.8	21	21.4	25.8
		≥18”	12.1	11	11.2	12.1

Table 36 Snags /acre >18" DBH and >12"DBH 20 years after treatment by alternative

	Description	Snag Size	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Project Area	Dry Lake Hills	≥12”	5.6	4.2	4.1	4
		≥18”	2.2	2.2	2.1	2.2
	Mormon Mountain	≥12”	6	2.9	3	3.2
		≥18”	1.6	1.8	1.8	1.8
Cover Type Dry Lake Hills	Ponderosa Pine	≥12”	5.7	3.8	3.8	3.6
		≥18”	2.1	1.9	1.9	1.8
	Mixed Conifer	≥12”	5.4	4.8	4.5	4.6
		≥18”	2.4	2.5	2.3	2.6
	Aspen	≥12”	2.2	2.2	2.2	2.2
		≥18”	0.1	0.1	0.1	0.1
Cover Type Mormon Mountain	Ponderosa Pine	≥12”	6.5	2.3	2.3	2.4
		≥18”	1	1.1	1.1	1.1
	Mixed Conifer	≥12”	4.5	3.9	4.1	4.2
		≥18”	2.7	2.8	3	3
	Wet Mixed Conifer	≥12”	7.3	5	5.1	7.3
		≥18”	4.1	3.9	4	4.1

Table 37 Snags/acre > 18" DBH and >12" DBH 40 years after treatment by alternative

	Description	Snag Size	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Project Area	Dry Lake Hills	≥12”	6.3	3.2	3.0	3.0
		≥18”	2.3	1.9	1.8	1.8
	Mormon Mountain	≥12”	8	2.6	2.7	2.9
		≥18”	2	1.7	1.7	1.7
Cover Type Dry Lake Hills	Ponderosa Pine	≥12”	7.2	3.3	3.3	3.0
		≥18”	2.7	1.9	1.9	1.7
	Mixed Conifer	≥12”	5.4	3.0	2.8	3.0
		≥18”	2.0	1.9	1.8	1.9
	Aspen	≥12”	0.0	0.0	0.0	0.0
		≥18”	0.0	0.0	0.0	0.0
Cover Type Mormon Mountain	Ponderosa Pine	≥12”	9.5	2.3	2.3	2.3
		≥18”	1.9	1.4	1.4	1.4
	Mixed Conifer	≥12”	4.7	3	3.1	3.2
		≥18”	2.1	2.1	2.2	2.2
	Wet Mixed Conifer	≥12”	6.8	4.9	5.1	6.8
		≥18”	3	2.8	2.9	3

Appendix C – Acres of Activity by Cover Type for Action Alternatives

Table 38 Alternative 2 –Acres of Activity by Cover Type

Cover Type	Total Acres	Temp Roads/ Relocated Roads	Skyline or Excaline Harvest Method	Cable Corridors	Ground Based	Hand Thinned	Treat in Place	No Treatment	Burn Only
Aspen	DLH – 22 MM -0					DLH- 22 MM-0			
Grassland	DLH – 60 MM - 0	DLH- 4/.4 MM -0			DLH-60 MM-0				
Ponderosa Pine	DLH –4059 MM – 0	DLH– 31/2 MM- 0	DLH – 356 MM - 0	DLH – 54 MM – 0	DLH - 1849 MM- 0	DLH – 230 MM -0		DLH 1395 MM-0	DLH 229 MM-0
Ponderosa Pine/Oak	DLH – 277 MM -1924	DLH -2/0 MM – 6/2	DLH -0 MM- 22	DLH-0 MM-9	DLH-263 MM-1850	DLH- 14 MM – 0			DLH -0 MM-52
Mixed Conifer	DLH –3118 MM -838	DLH 26/3.3 MM- 4/0	DLH – 828 MM – 51	DLH –142 MM - 22	DLH- 1320 MM- 470	DLH – 433 MM – 0	DLH – 15 MM – 0	DLH 183 MM – 0	DLH 339 MM-317
Wet Mixed Conifer	DLH –0 MM -213		DLH – 0 MM - 33	DLH – 0 MM – 14		DLH – 0 MM - 147			DLH – 0 MM- 33
ROW	DLH – 33 MM -	DLH- .3 MM- 0			DLH – 6 MM – 0			DLH – 27 MM-0	
Total	DLH -7569 MM-2975	DLH-63.3 MM-10	DLH -1184 MM-106	DLH- 196 MM-45	DLH-3498 MM-2320	DLH-699 MM-147	DLH-15 MM-0	DLH – 1605 MM-0	DLH-568 MM-402

Table 39 Alternative 3 Acres of Activity by Cover Type

Cover Type	Total Acres	Temp Roads/ Relocated Roads	Helicopter Harvest Method	Ground Based	Hand Thinned	None	Steep Slope	Burn Only
Aspen	DLH – 22 MM -0				DLH- 22 MM-0			
Grassland	DLH – 60 MM - 0	DLH – 4/.4 MM – 0		DLH-60 MM-0				
Ponderosa Pine	DLH- 4059 MM -0	DLH–26/2 MM- 0	DLH – 296 MM - 0	DLH –1849 MM -0	DLH – 230 MM - 0	DLH -1395	DLH-60 MM-0	DLH- 229 M- 0
Ponderosa Pine/Oak	DLH – 277 MM -1924	DLH -2/0 MM -6/2		DLH-263 MM- 1850	DLH- 14 MM – 0		DLH-0 MM - 22	DLH -0 MM-52
Mixed Conifer	DLH –3118 MM -838	DLH –15/3 MM- 3/0	DLH – 676 MM – 0	DLH- 1320 MM- 470	DLH – 387 MM – 0	DLH-183 MM – 0	DLH - 213 MM-51	DLH -339 MM- 316
Wet Mixed Conifer	DLH –0 MM -213				DLH – 0 MM - 180			DLH – 0 MM- 33
ROW	DLH – 33 MM -0	DLH - .3/0 MM- 0		DLH – 6 MM – 0		DLH – 27 MM-0		
Total Acres	DLH-7569 MM-2975	DLH-47.3 MM-9.0	DLH-972 MM-0	DLH-3498 MM-2320	DLH-653 MM-180	DLH-1605 MM-0	DLH-273 MM-73	DLH-568 MM-401

Table 40 Alternative 4 Acres of Activity by Cover Type

Cover Type	Total Acres	Temp Roads/ Relocated Roads	Ground Based	Hand Thinned	None	Burn Only
Aspen	DLH – 22 MM -0		DLH- 2 MM -0		DLH- 20 MM-0	
Grassland	DLH – 60 MM - 0	DLH - 4/.4 MM - 0	DLH-53 MM-0		DLH -7 MM-0	
Ponderosa Pine	DLH –4059 MM – 0	DLH–18/2 MM- 0	DLH –1556 MM- 0	DLH-193 MM -0	DLH 2310 MM - 0	DLH - 0 MM- 0
Ponderosa Pine/Oak	DLH – 277 MM -1923	DLH -2/0 MM – 6/0	DLH-224 MM- 1850		DLH – 52 MM – 52	DLH -0 MM-22
Mixed Conifer	DLH –3118 MM -838	DLH –14/3 MM- 3	DLH- 1114 MM- 460	DLH –242 MM –0	DLH- 1694 MM –366	DLH –67 MM-12
Wet Mixed Conifer	DLH –0 MM -212				DLH - 0 MM-212	
ROW	DLH – 33 MM -0	DLH- .3 MM-0	DLH -6 MM- 0		DLH –27 MM- 0	
Total Acres	DLH-7569 MM-2975	DLH-38.3 MM-9.0	DLH-2955 MM-2310	DLH-435 MM-0	DLH-4110 MM-630	DLH-67 MM-34

Appendix D FWPP Cumulative Effects Project List

		PAST	PRESENT (ONGOING)	REASONABLY-FORESEEABLE
DRY LAKE HILLS	**Forest Thinning & Burning Projects**	Fort Valley Experimental Forest (thinning & burning)		
		GFFP thinning around communication site		
			Wing Mountain Fuels Reduction Project	
		Eastside Fuels Reduction Project		
		Jack Smith Schultz Fuels Reduction Project (and ongoing)		
				4FRI
				Treatments on the Navajo Nation parcel as well as adjacent State and private land
	Wildfires	Schultz Fire (2010) 15,075 acres		
		Radio Fire (1977) 4,594 acres		
	Restoration Work	Schultz Reforestation		
		Schultz Sediment Reduction (acres)		
	Recreation	Arizona Trail construction		
			Special Use Events	
			Fort Valley Trails	
				MEDL
			Hunter Access to Aspen Depredation	
	Grazing	Peaks Allotment (pastures not grazed in over 10 years; deferred from grazing now)		
	Lands Projects			Elden/Devils Head comm sites – potential tower additions
		Travel Management Rule		

		PAST	PRESENT (ONGOING)	REASONABLY-FORESEEABLE
MORMON MOUNTAIN	**Forest**	Mormon Lake Basin		

	Thinning & Burning Projects	Fuels Reduction Project		
				4FRI
	Wildfires	??		
	Recreation		Dispersed recreation	
			hunting	
	Grazing	Tinny Springs Allotment: Five hundred cow/calf pairs are permitted to graze on the Tinny Springs allotment from June 1 through October 31 using a deferred rotation grazing system.		
		Pickett Lake/Padre Canyon Allotment: Nine hundred 13 adult cattle are permitted to graze on the allotment from June 1 through September 30 using a deferred, rest rotation grazing system.		
	Lands Projects	Mormon Mt APS Line – final rehab needed but mostly complete		
				APS Youngs to Mormon Lake new 69kv line
				Mormon Mt Comm Site
			FH3 Tree Clearing	
			Travel Management Rule	

Appendix E Draft FWPP MSO Monitoring Plan

Proposed Mexican spotted owl Monitoring, Flagstaff Watershed Protection Project

As part of the Flagstaff Watershed Protection Project (FWPP), fuels reduction and prescribed burning activities will occur within Mexican spotted owl protected activity centers (PACs). Protected activity centers are occupied habitat. The effects of these treatments to owls and nesting/roosting habitat are not fully known. The Mexican spotted owl Recovery Team thinks that PACs can be afforded substantial protection by emphasizing fuels reduction and forest restoration in surrounding areas outside of PACs and nest/roost habitat, it is recognized that in some cases protection of nest/roost habitat and human communities requires these action to occur within PACs. The Mexican spotted owl Recovery Plan, First Revision (USFWS 2012) provides guidance for these treatments and emphasizes the need for monitoring and feedback loops to allow management to be adaptive. Well-designed monitoring will provide valuable information on the effects of these activities on the owls and their habitat. Therefore, the Forest Service is working with the U.S. Fish and Wildlife Service (FWS) and Rocky Mountain Research Station (RMRS) to propose a monitoring plan that should help us begin to understand the effects of thinning and burning on Mexican spotted owls and their habitat.

The proposed monitoring plan would pair treated and untreated (reference) PACs (treatments still to be determined) within the Dry Lake Hills (n=3) and Mormon Mountain (n=5) portions of the project and compare occupancy rates, reproduction rates, and habitat changes.

Guiding Question:

- Do planned treatments (e.g., thinning, prescribed fire) affect occupancy and reproductive rates in treated versus untreated PACs?

Identified Response Variables:

- Owl occupancy rate (corrected for detection probability; the percent of PACs occupied before and after treatments).

- Owl reproductive output (the number of fledglings observed per adequately checked pair before and after treatments).

- Habitat change (the immediate effect of a treatment type on key variables selected from Table C.1 showing description of desired conditions [DCs]) in forest and woodland cover types typically used by Mexican spotted owls for nesting and roosting. Analysis would incorporate what is retained as well as extent of change.

Planned Treatments:

- Treatments will likely be variable in spatial extent and intensity (intensity measured by degree of change in key habitat variables related to DCs [see Table C.1]).

General Study Design Approach:

- For each treatment areas (Dry Lake Hills and Mormon Mountain) monitoring will contrast a set of reference PACs (with no planned treatments) to a set of treatment PACs. Reference PACs will match the environmental conditions in PACs where treatments are proposed, as closely as possible.

    - For the Mormon Lake project area treatments are proposed for the following PACs: Mormon Mountain North (040508), Red Raspberry (040503), Archies (040534), Weimer Springs (040532), and Detoros (040533). Reference PACs still need to be determined. Since the proposed areas for treatment are predominately mixed conifer, controls need to be similar. Three potential reference PACs Mormon Mountain (040551), Lockwood (040541), Moore Well (Rock Dike) (040511) overlap with the project area (149, 148, and 20 acres respectively. However, we may be able to use these PACs by proposing treatments that occur later in time or slightly modifying the project boundary. Lockwood PAC also overlaps with the identified potential "reference watershed" for a study being conducted in 4FRI. Two other possible reference PACs that do not occur within the project area are Dairy Spring (040507) and Mayflower Tank (040522).

    - For the Dry Lake Hills project area three PACs are proposed for treatment: Mt. Elden (040202), Schultz Creek (040206), and Orion Spring (040207). Three potential reference PACs are: Snowbowl (040205)/Viet (040234), Little Spring (040227), and East Bear Jaw (040233).

- PACs may be stratified by treatment type (once we know treatment types)

Sampling Considerations:

- Identify set of PACs for a planned type of treatment.
- Identify set of reference PACs for each geographic area and cover type.
- Sample response variables for owls each year, using a design that allows estimation of effects to occupancy, detection probability, reproductive output, and habitat DCs.
- Sample timing: one year pre-treatment, during treatment year, and one, three, and five years post-treatment.
- Identify DC variables (Table C.1) that measure habitat change to calibrate treatment effects.

Potential Analytic Approaches:

- Will depend on sample size.

- Possibilities include: *In development*

Quality Control / Assurance

- A monitoring plan will be written that includes the details for sample selection, treatment specifics, measurement protocols including timing, and planned analyses.

- The monitoring plan will be reviewed as part of the consultation process for treatments planned to occur within PACs.

Appendix F Draft Red squirrel Monitoring Plan

Red Squirrel Monitoring Proposal

9/30/2013

Prepared by: Fenner Yarborough and Andi Rogers, Arizona Game and Fish Department

Purpose and Need

The Flagstaff Watershed Protection Project (FWPP) is a cooperative effort between the City of Flagstaff, US Forest Service, and the State of Arizona to treat 15,000 acres. The primary purpose of the FWPP is to reduce the risk of high severity wildfire and subsequent flooding in two key watersheds around Flagstaff, Arizona: in the Dry lake Hills portion of the Rio de Flag Watershed, and the Mormon Mountain portion of the Upper Lake Mary Watershed. Treatments will include traditional logging, hand thinning, prescribed fire, helicopter logging, and cable logging.

Red squirrels (*Tamiasciurus hudsonicus*) are primarily associated with mixed conifer forest in the Southwest. The red squirrel is a Management Indicator Species for the Coconino National Forest. Red squirrels play an important role in forest ecology and restoration, as they are excellent indicators of changes as a result of forest treatments. Red squirrels require a forest structure that provides large areas of closed canopy and large trees that produce an abundant cone crop. The purpose of this study is to initiate monitoring of red squirrels (*Tamiasciurus hudsonicus*) on the Coconino National Forest in order to establish long-term trends in populations and habitat use and the effects of forest restoration on red squirrels.

Study Sites

We would generate geographic information system (GIS) vegetation cover maps for conifer forest stands within the FWPP study area. We would locate study sites within GIS cover types white fir, Douglas fir, blue spruce, and Engelmann spruce. We would preferentially select large stands (big enough to contain two 600 m x 10 m) belt transects. We would place the trance starting point and bearing to insure that each transect was fully contained within the stand and well away from forest edges.

Methods

An index of red squirrel density will be determined by counting active, primary middens on each of two belt transects in a study site. One squirrel normally maintains and defends one primary midden. Thus, the density of active primary middens is a conservative estimate of squirrel density. Midden activity can provide a means for monitoring red squirrels in large areas. We would use active midden density in belt transects as an estimate of population size.

We would follow the methods set up by Frey (2003) and set up two belt transects in each study area. The belt transects (600 m x 10 m) would be located throughout the FWPP project area that contain red squirrel habitat. The observer would walk each transect, maintain a bearing, and look for red squirrel middens within 5 m of each side of the transects. We would record data on each midden

(size, age, activity, and location). We would collect habitat data related to forest structure at random points along each transect.

Analysis

We would test if red squirrel midden density differed by cover or vegetation type. We would determine if squirrel midden density changed pre and post treatment. We would also summarize mean tree density and size class (DBH) to summarize stand size structure of dominant conifer tree species across all red squirrel sampling transects pre and post treatment.

Expected Results

Our expected results could help refine habitat relationship patterns in order to better direct forest management in ways that will benefit this species.

Literature Cited

Frey, Jennifer K. 2003. Initiation of Red Squirrel (*Tamiasciurus hudsonicus*) Monitoring on Carson National Forest, New Mexico. A Final contract R3-02-03-12 Completion Report Submitted to Carson National Forest, Taos, New Mexico.